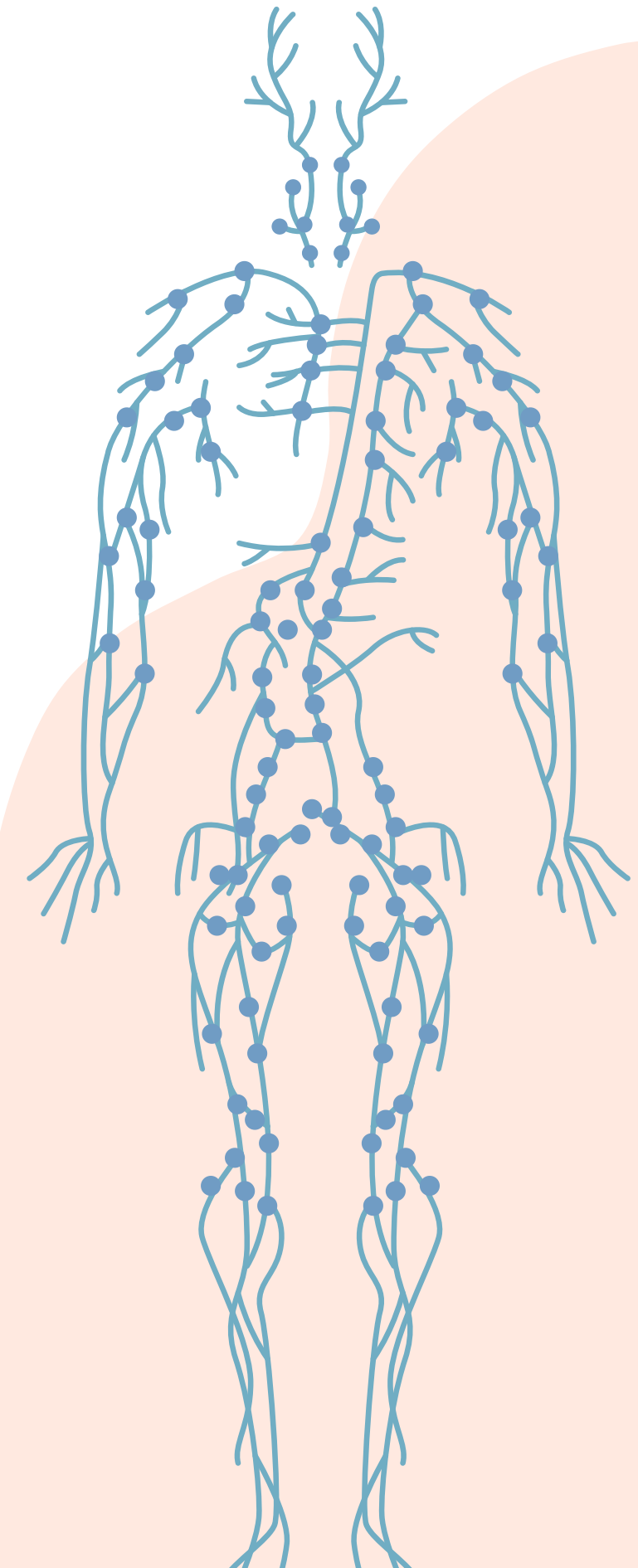


بسم الله الرحمن الرحيم

DEEP VEIN THROMBOSIS

Created By : Leen Al_shamassen
Heba Hesham
Hazem Abd Alqader
Omar Al_Khamaiseh

لا تنسوا الدعاء لإخواننا في غزة



anatomy

Superficial Veins:

- Superficial veins are less involved in life-threatening conditions like DVT

Deep veins

- Location: deeper in the body inside the muscle layer and run alongside the arteries.
- Function: Deep veins carry the majority of venous blood back to the heart. Their walls are thicker assisted by the "muscle pump" mechanism

.



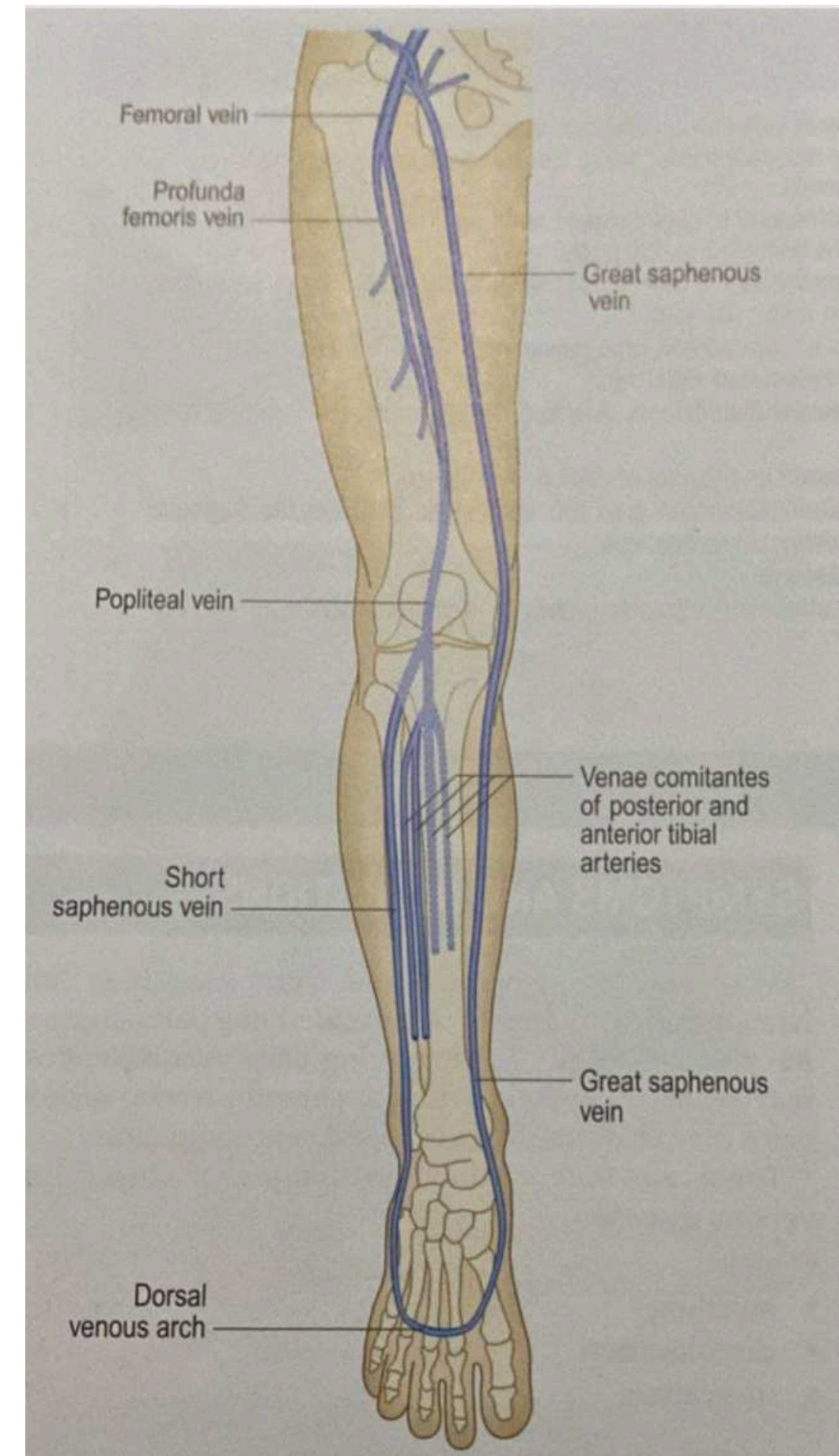
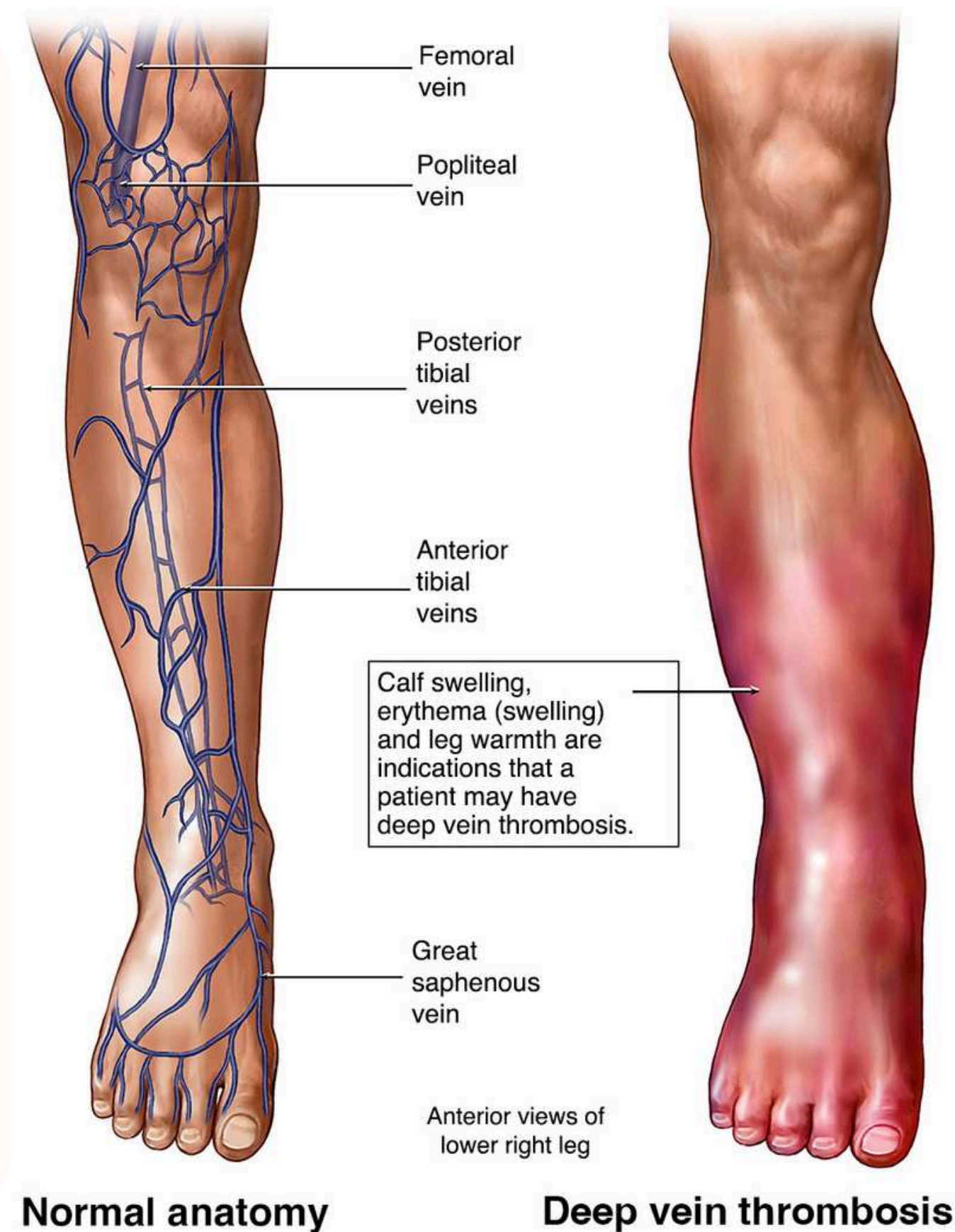
VENOUS THROMBOEMBOLISM- VENOUS DISEASES INCLUDE THE FOLLOWINGS :

1-DEEP VEIN THROMBOSIS-
DVT-.

2-SUPERFICIAL
THROMBOPHLEBITIS.

3-VARICOSE VEINS

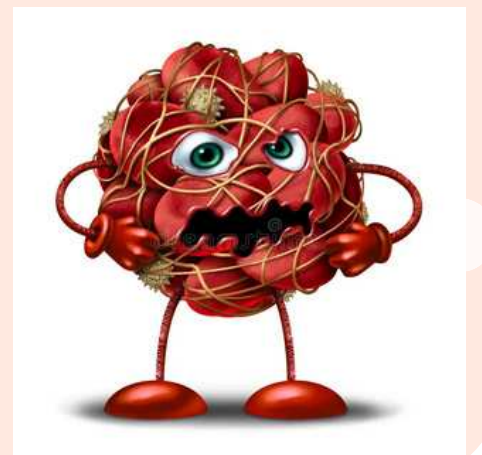
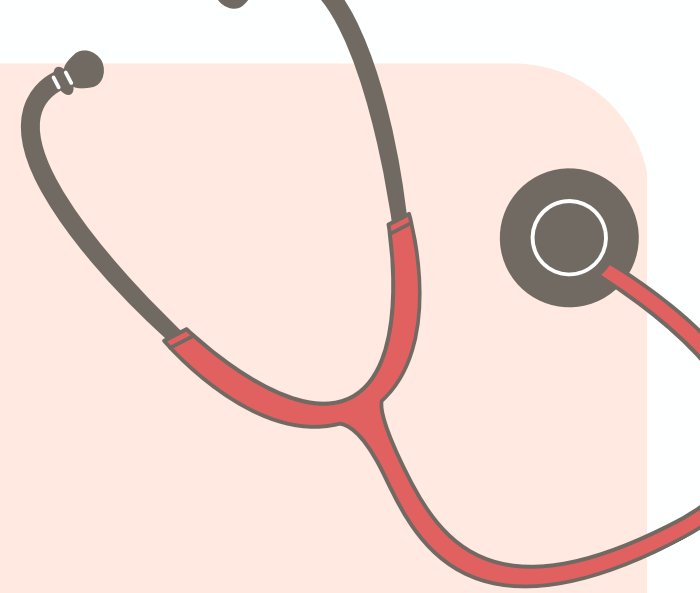
4-CHRONIC VENOUS
INSUFFICIENCY



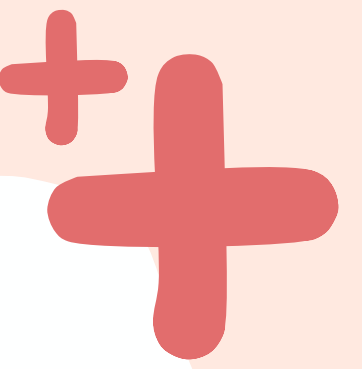
DVT:

deep venous thrombosis :
the formation of a blood clot (thrombus) in the deep veins, most commonly in the legs. It is a serious condition because the clot can dislodge and travel to the lungs, causing a potentially life-threatening pulmonary embolism (PE).

The most common sites of venous thrombosis are the veins of the legs or the pelvis, but they can occur in any vein in the body.



INTRODUCTION:

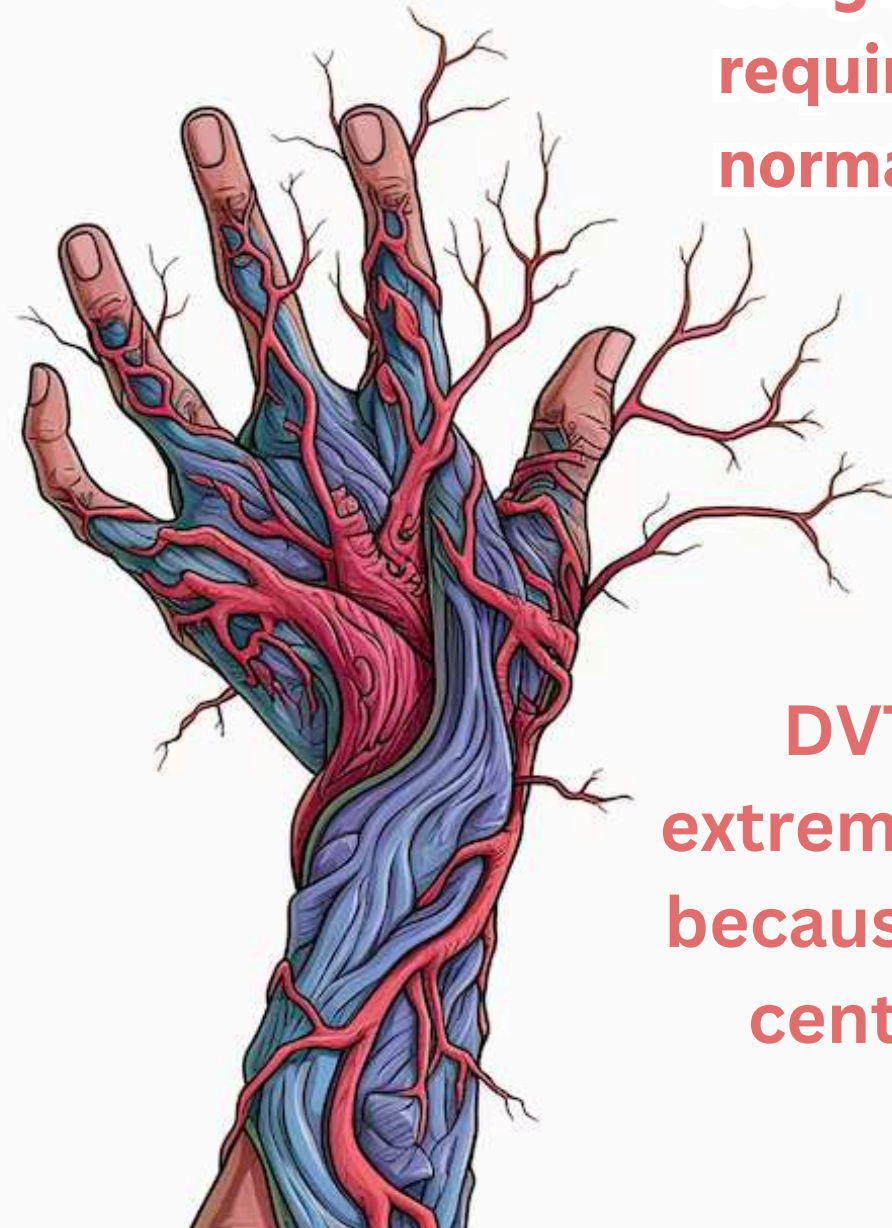


the most common area in the lower extremity affected by deep vein thrombosis (DVT) is the calf veins usually on the venous valves of the calf particularly the posterior tibial and peroneal veins.

That is because these veins tend to work much harder to push blood back up the body to the heart, which makes them more vulnerable to damage and disorders.

DVT often begins in the distal deep veins of the calf, and if untreated, it can extend proximally to involve the popliteal, femoral, and iliac veins, which significantly increases the risk of pulmonary embolism.

Proximal DVT, involving the popliteal or femoral veins, is generally considered more dangerous due to the higher likelihood of embolization.



A pulmonary embolism is characterized by chest pain, shortness of breath and coughing up blood. Emergency treatment is required to remove the clot and restore normal function to the lungs.

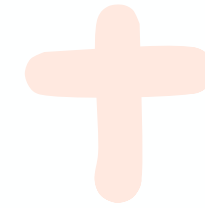
DVT occurs less frequently in upper extremities, but the incidence is increasing because of greater utilization of indwelling central venous catheter (central line)

INTRODUCTION:

- **Unilateral DVT:** Over 90% of DVT cases.
- **Bilateral DVT:** Less than 10% of cases, and usually indicates an underlying condition
- **Incidence and Prevalence Globally and Regionally:** DVT affects about 1 to 2 per 1,000 people annually worldwide.

The male to female ratio is 1.2:1, indicating that males have a higher risk of DVT than females. Women may be at increased risk during pregnancy, post-partum, or while using estrogen-containing medications and more than men.

Normal Blood Flow: In a healthy circulatory system, blood flows smoothly through veins. Clot formation occurs as a protective response to injury or stasis etc.



Importance of Recognizing and Preventing DVT: Early recognition of DVT is crucial to prevent complications such as PE, which can be fatal. Preventive measures, especially in high-risk populations (e.g., hospitalized patients, post-surgical individuals), include anticoagulation therapy, compression stockings, and early mobilization.



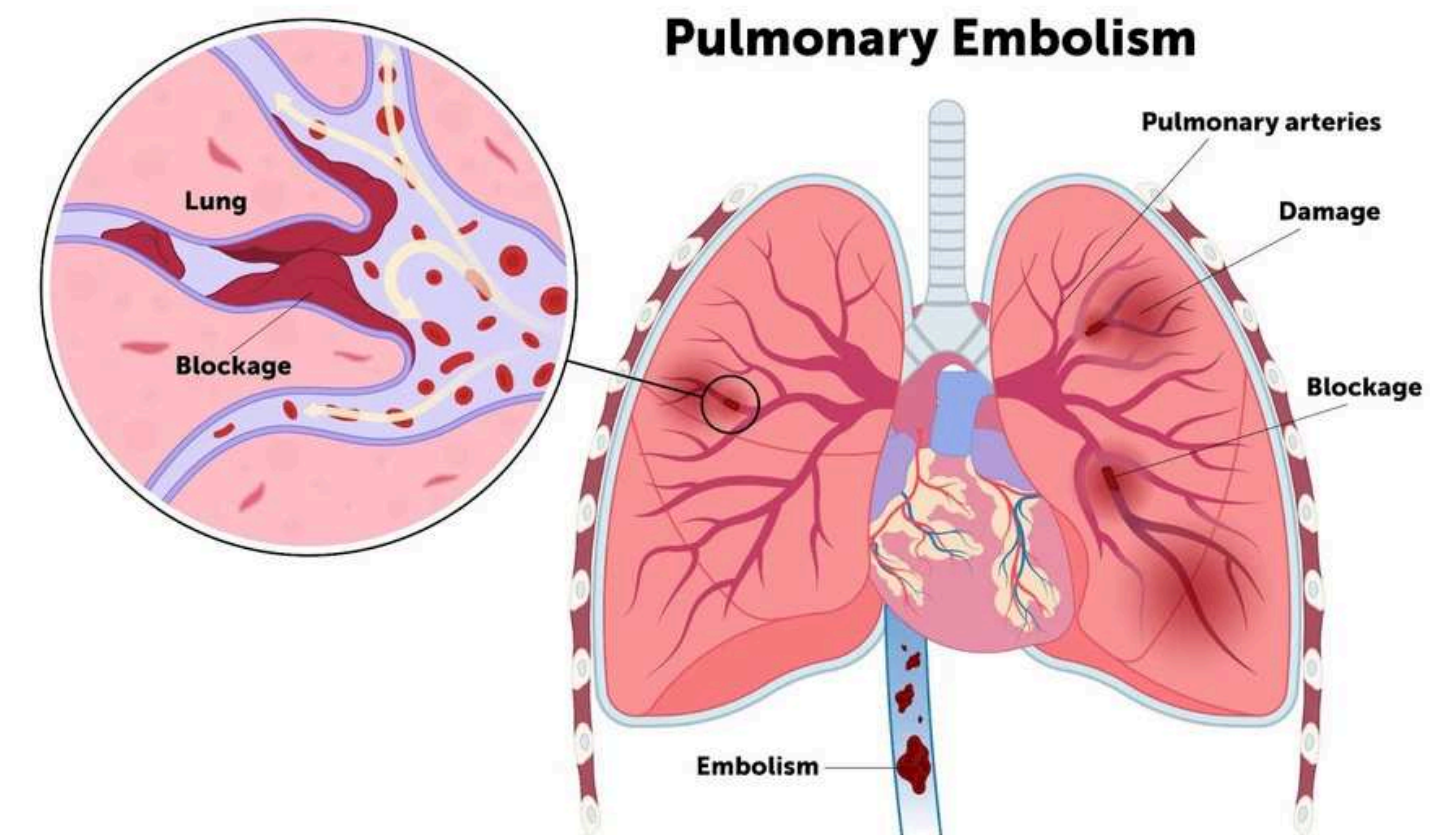
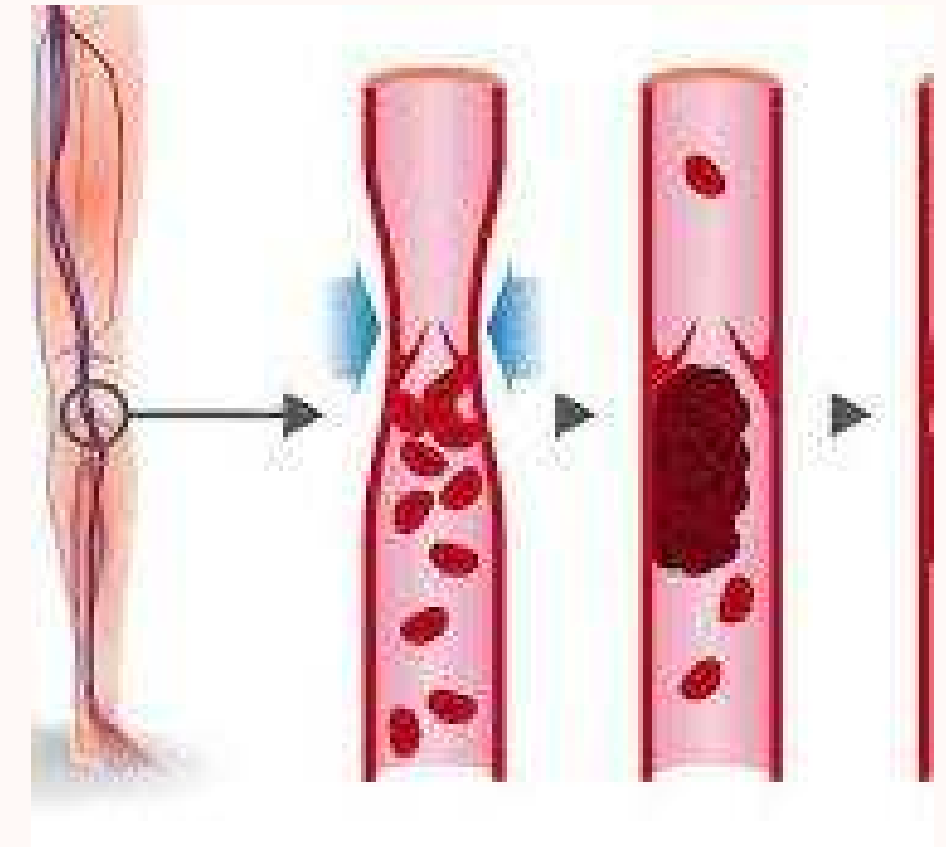
CON:

vein thrombosis & (PE) pulmonary embolism are an important & common complications of general surgeries .studies suggest most common that they are the direct death in surgical patients .

Pulmonary embolism (PE) is not usually an immediate complication, but can present in the early postoperative period. Thrombus can arise from DVT in the legs/pelvis, venae cavae or the right atrium. Signs and symptoms depend on the size of the embolus and may range from dyspnoea, cough, and pleuritic chest pain to sudden cardiovascular collap

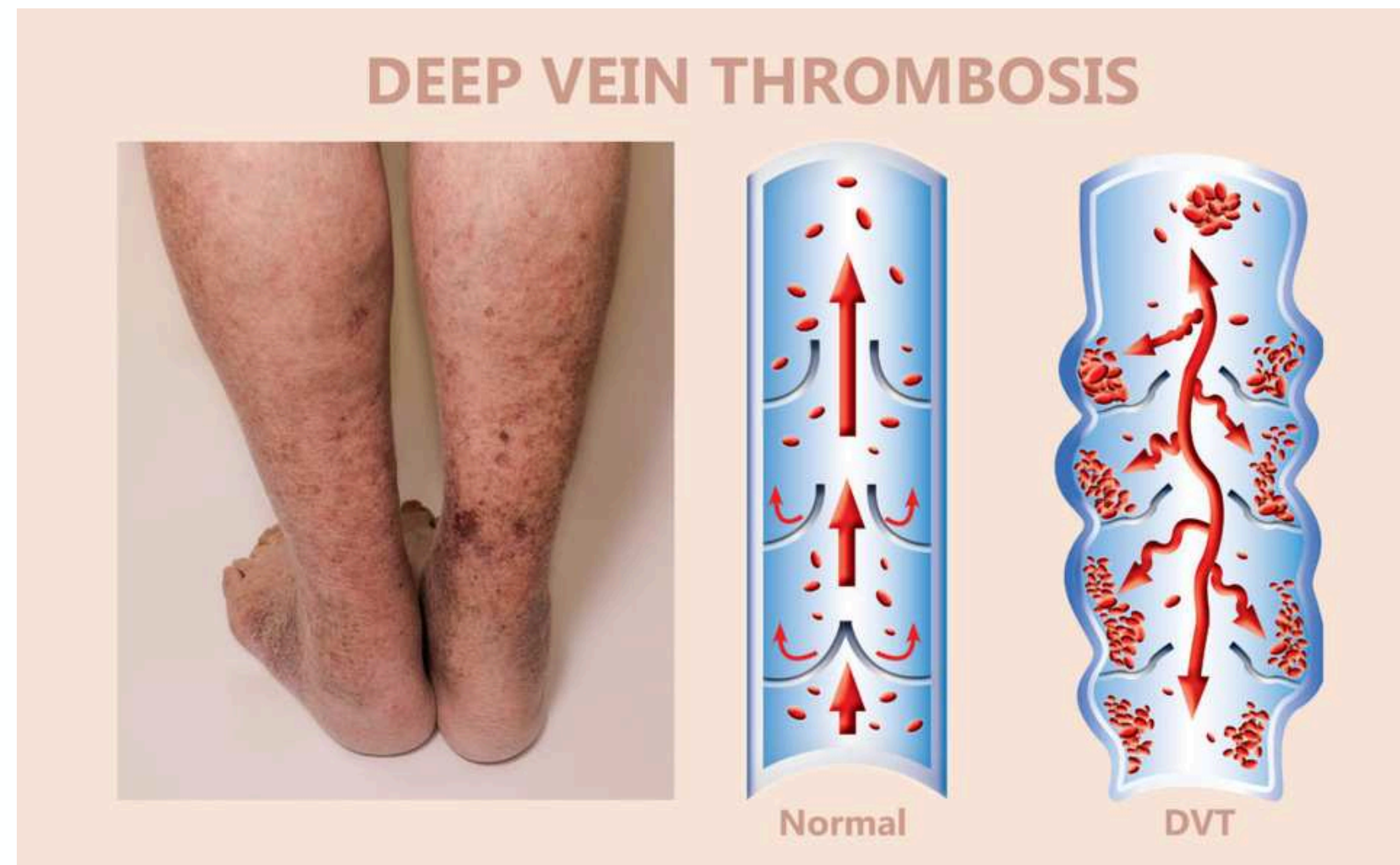
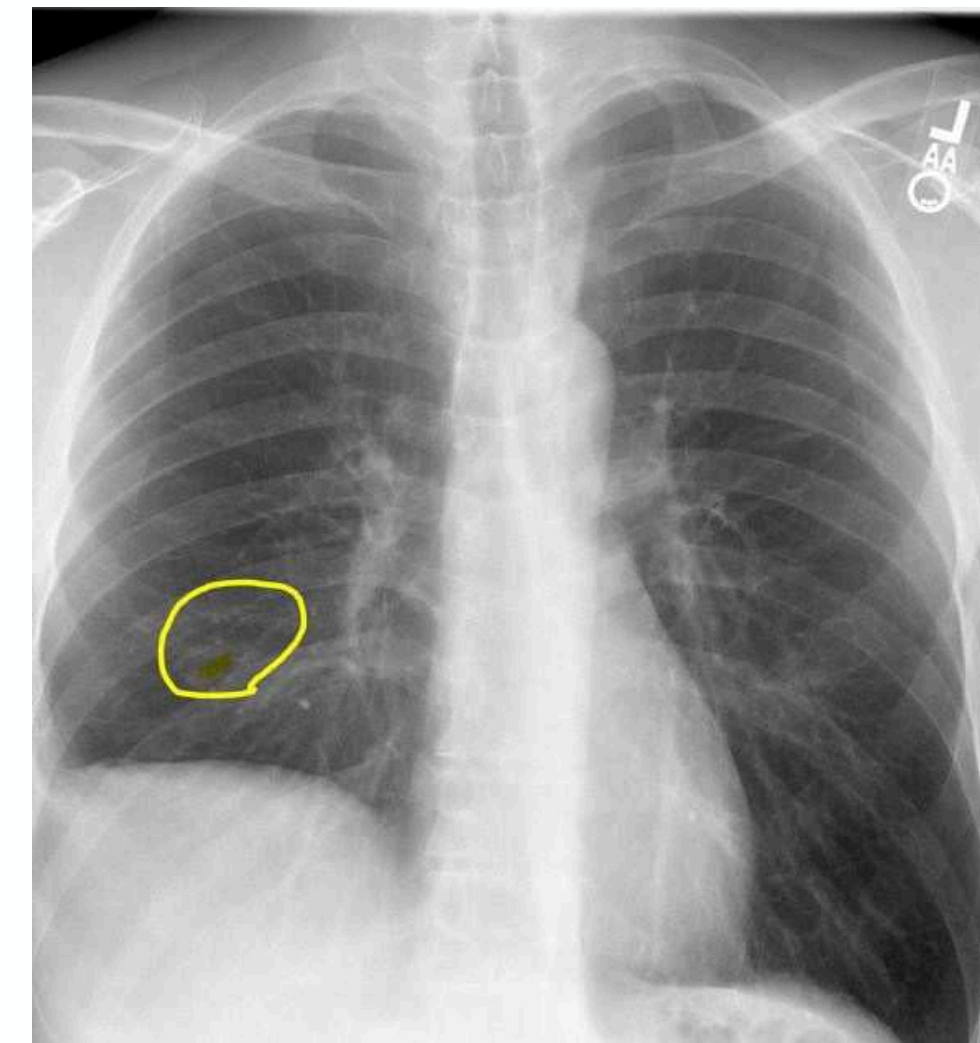
DVT divide :

- OCCLUSIVE- DVT
- NON-OCCLUSIVE -DVT which carries high RISK due to massive PE in this case the leg may be normal on examination



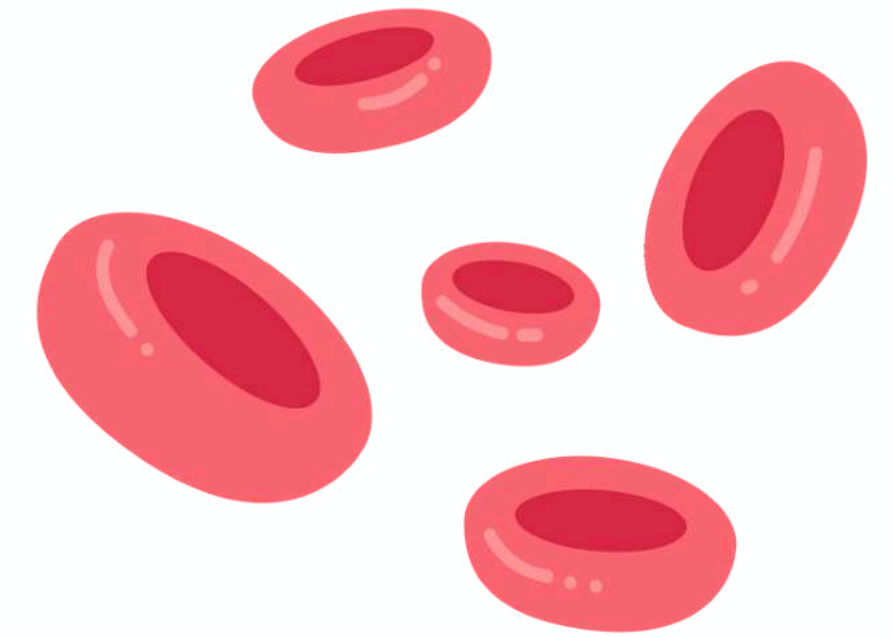
if thrombogenesis predominates over thrombolysis. A thrombus can detach from the endothelium and migrate into the pulmonary system, becoming a PE.

Thrombi localized to the calf have lesser tendency to embolize than thrombi that extend to the thigh veins. Approximately 20% of cases of calf DVT propagate to the thigh, and 50% of cases of thigh or proximal DVT embolize. It is estimated that 10% to 30% of people with untreated DVT will develop a PE.





CONTINUE....

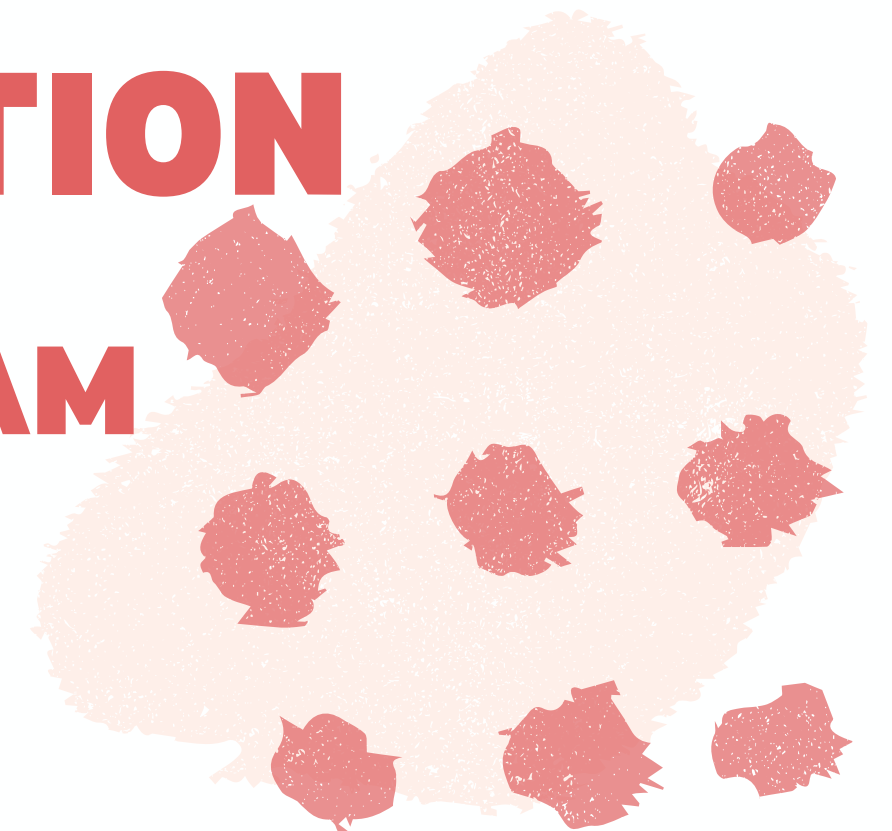
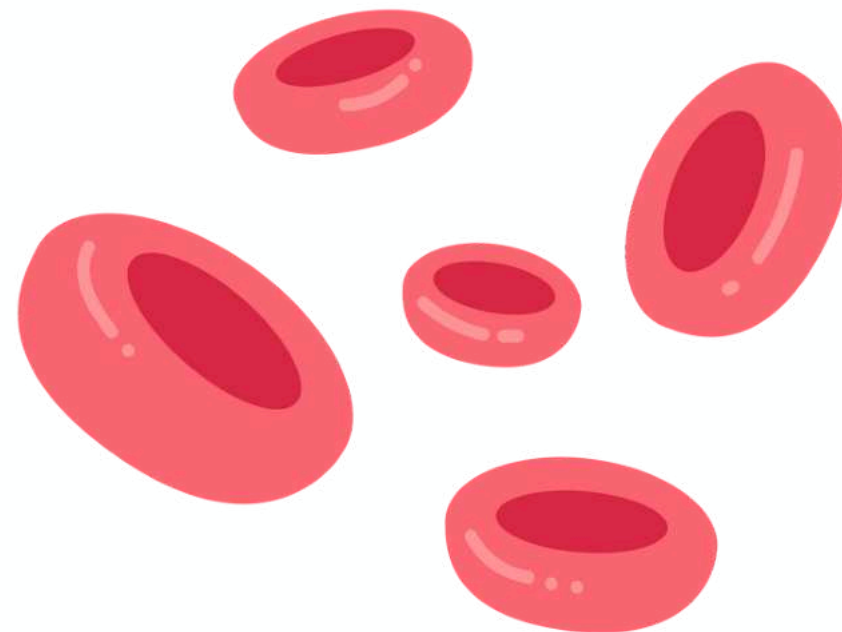
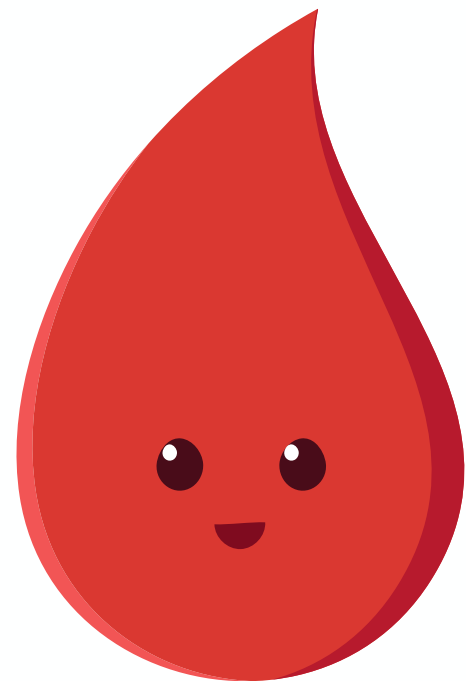


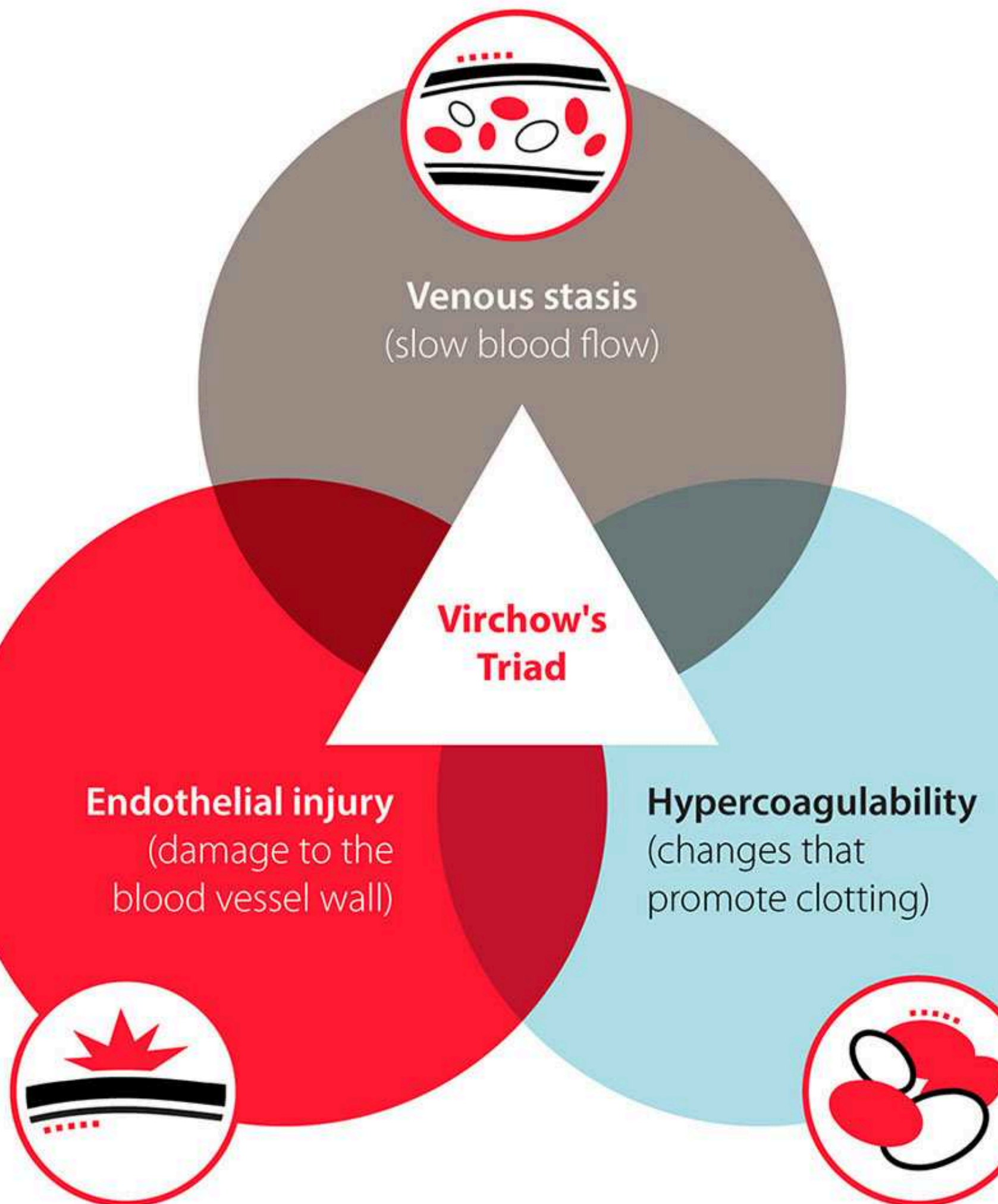
PATHOPHYSIOLOGY OF DVT

RISK FACTOR

CLINICAL PRESENTATION

HEBA HESHAM





Aetiology :-

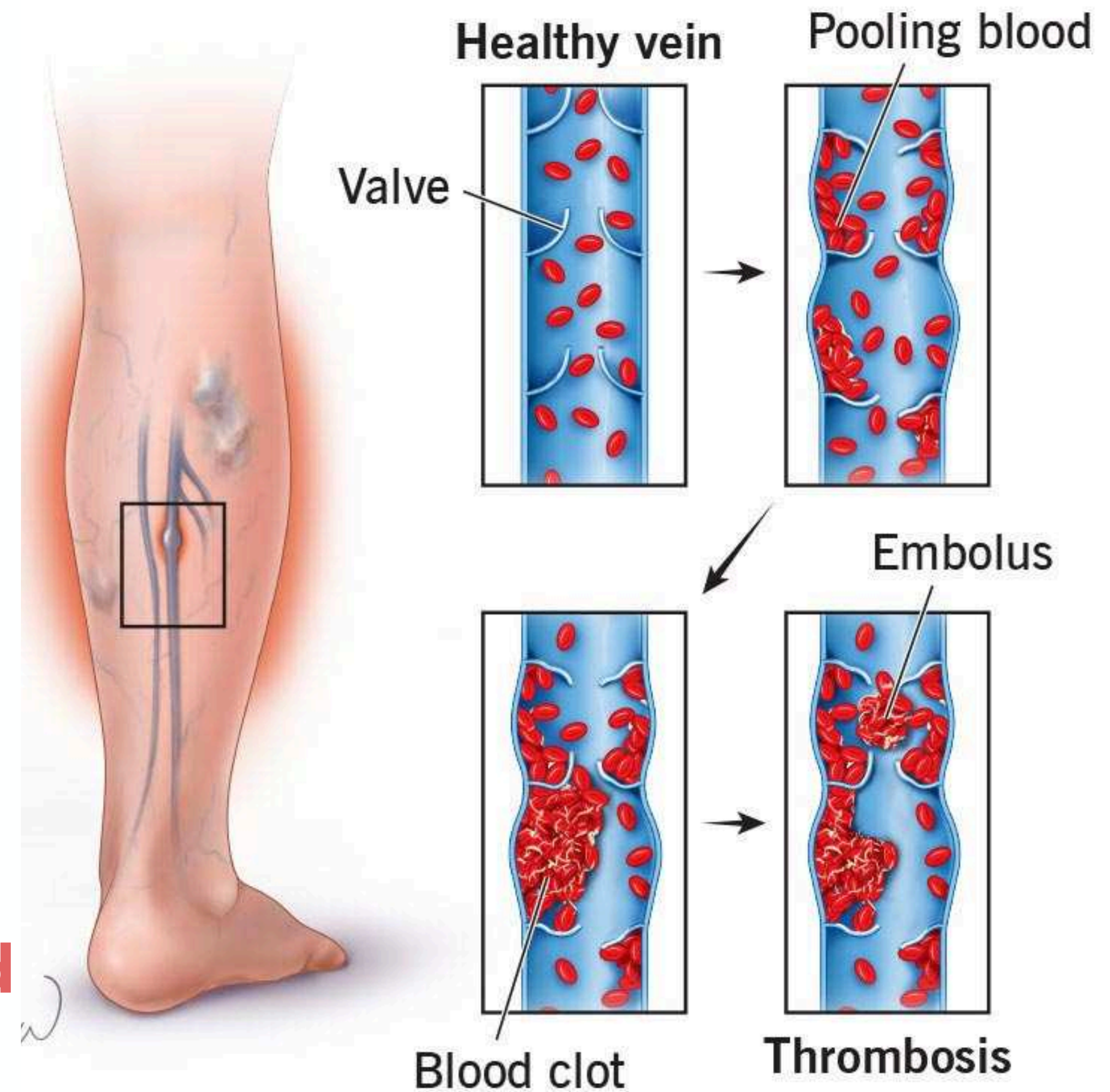
In understanding the causes of blood clot formation, one of the most important concepts is Virchow's Triad. This model, outlines three key factors that contribute to the development of thrombosis, or blood clots.

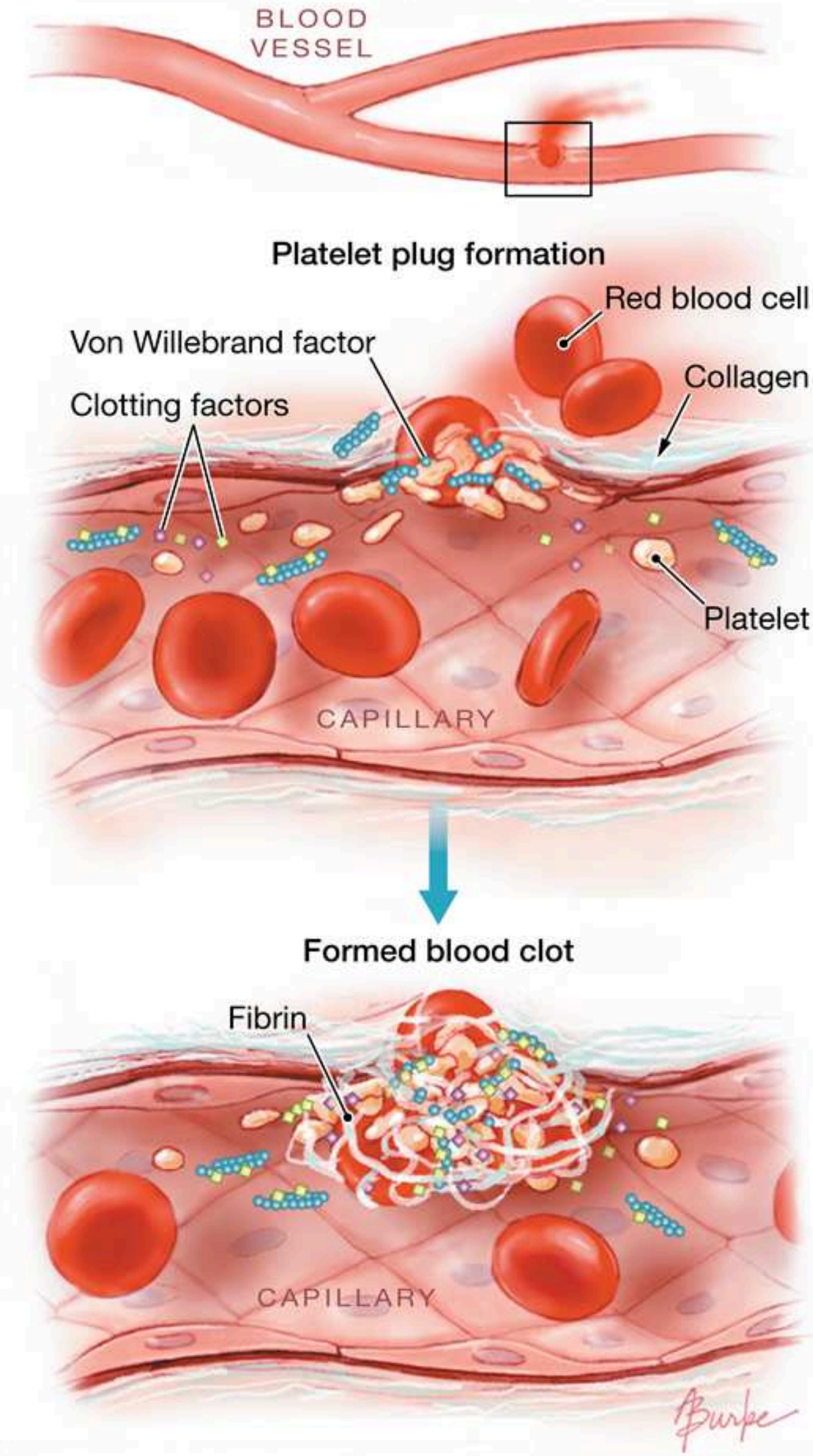
These factors include :-

- 1-venous stasis (slowed blood flow),**
- 2-endothelial injury (damage to the blood vessel walls),**
- 3- hypercoagulability (increased tendency of the blood to clot).**

1-Stasis

Venous stasis , refers to the slowing of blood flow in the veins, typically due to prolonged immobility (e.g., long flights, bed rest). This slow-moving blood increases the risk of clot formation because the lack of movement prevents normal blood circulation, allowing blood to clot more easily.



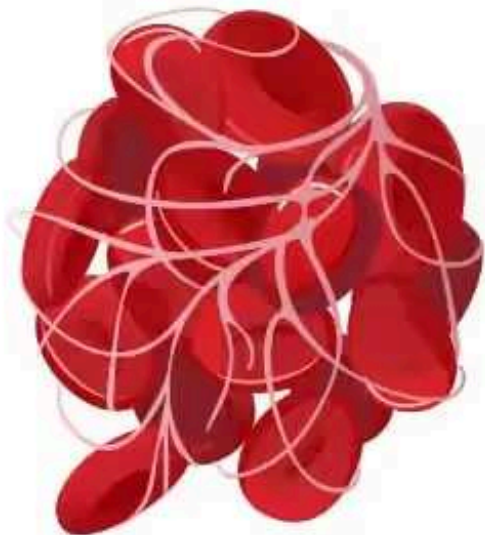


2- Damage to the vein wall prompts thrombus formation on the damaged endothelium .The damage may be due to an inflammatory process ,or may be due to direct damage at operation (particularly the pelvic veins during pelvic procedures)



3. HYPERCOAGULABILITY: ALSO KNOWN AS THROMBOPHILIA, IS A DISORDER OF THE BLOOD CLOTTING SYSTEM IN WHICH THE BLOOD HAS AN INCREASED TENDENCY TO FORM CLOTS.

Hypercoagulable State



Inherited Disorders



Acquired Disorders

“IN NORMAL HEMOSTASIS, THERE IS A DELICATE BALANCE BETWEEN PROCOAGULANT AND ANTICOAGULANT FACTORS THAT MAINTAIN BLOOD FLUIDITY WHILE PREVENTING EXCESSIVE BLEEDING. HOWEVER, WHEN THIS BALANCE SHIFTS TOWARDS A PROCOAGULANT STATE—EITHER DUE TO INCREASED LEVELS OF CLOTTING FACTORS, DECREASED ANTICOAGULANT ACTIVITY, OR IMPAIRED FIBRINOLYSIS—THE BLOOD BECOMES PRONE TO ABNORMAL CLOT FORMATION. THIS IMBALANCE IS CENTRAL TO THE DEVELOPMENT OF A HYPERCOAGULABLE STATE

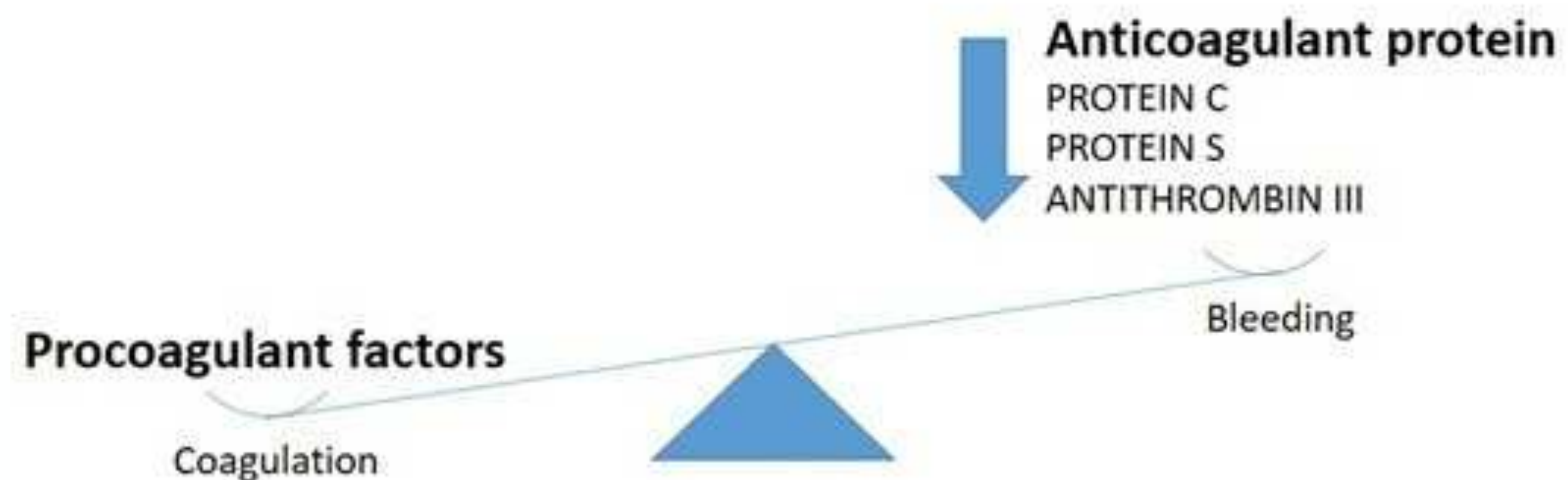




Table 57.2 Abnormalities of thrombosis and fibrinolysis (thrombophilia) that lead to an increased risk of venous thrombosis.

Congenital	Deficiency of antithrombin III, protein C or protein S
	Antiphospholipid antibody or lupus anticoagulant
	Factor V Leiden gene defect or activated protein C resistance
	Dysfibrinogenemias
Acquired	Antiphospholipid antibody or lupus anticoagulant

RISK FACTOR FOR DVT

Patient factors	Age
	Obesity
	Varicose veins
	Immobility
	Pregnancy
	Puerperium
	High-dose oestrogen therapy
	Previous deep vein thrombosis or pulmonary embolism
	Thrombophilia (see <i>Table 57.2</i>)
Disease or surgical procedure	Trauma or surgery, especially of pelvis, hip and lower limb
	Malignancy, especially pelvic, and abdominal metastatic
	Heart failure
	Recent myocardial infarction
	Paralysis of lower limb(s) infection
	Inflammatory bowel disease
	Nephrotic syndrome
	Polycythaemia
	Paraproteinaemia
	Paroxysmal nocturnal haemoglobinuria
	antibody or lupus anticoagulant
	Behçet's disease
	Homocystinaemia

Risk Factors for **Venous Thromboembolism**



Age



Sex



Family History



Pregnancy



Race or Ethnicity



Hormone-Based
Medicines



Not Moving for Long Periods



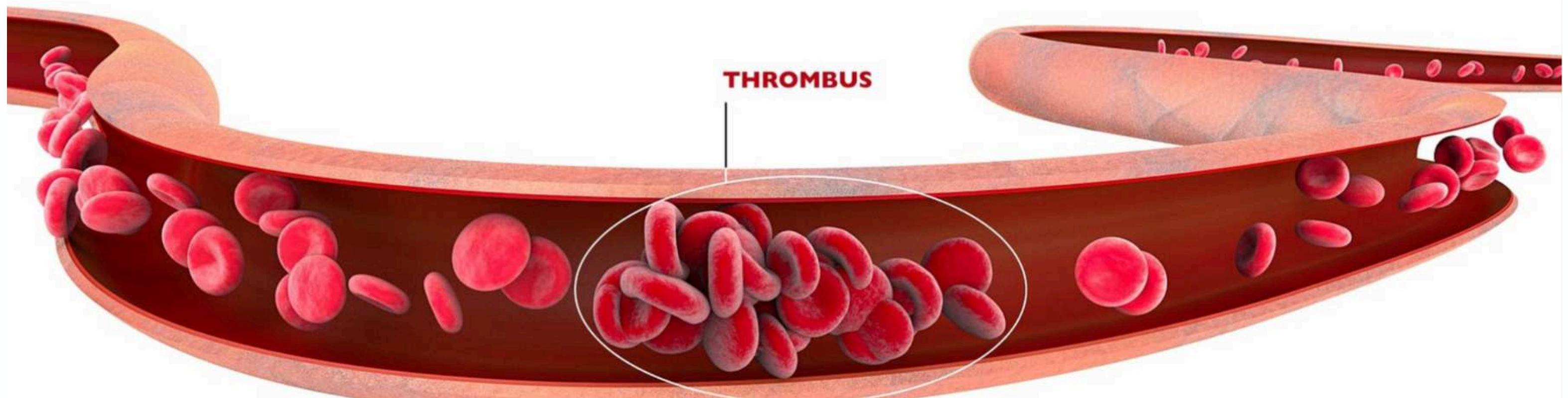
Surgery



Certain Medical
Conditions

Symptoms/ clinical presentation:

Only a quarter of deep vein thromboses cause symptoms and signs. Many occur spontaneously, but in more than one-half there is a predisposing cause such as an operation, bed rest, thrombophilia or recent air travel.



SIGNS AND SYMPTOMS OF **DEEP VEIN THROMBOSIS** (DVT)



SHORTNESS
OF BREATH



SUDDEN SHARP
CHEST PAIN



COUGHING



1-SWELLING OF A LEG, PARTICULARLY IF IT IS UNILATERAL, IS THE MOST SIGNIFICANT PHYSICAL SIGN .THE ANKLE MAY BE THE ONLY SITE OF SWELLING IF THE THROMBOSIS IS CONFINED TO THE CALF. THE SWELLING MAY EXTEND UP TO THE GROIN IF THE ILIAC VEIN IS THROMBOSED.

2-The muscles that contain the thrombosed veins may become hard and tender. A change in texture of the muscle is more significant than tenderness .

.'Pain'on stretching the calf muscles by forced dorsiflexion is known as Homan's sign

3-The superficial veins may be dilated, and the leg may feel hot. A large, swollen limb that is made pale by severe oedema is called phlegmasia alba dolens.



4-When the venous thrombosis blocks almost all the main outflow veins, the skin of the leg becomes congested and blue. This is called phlegmasia caerulea dolens.

5-Venous gangrene can develop when there is very severe venous outflow obstruction. Venous gangrene usually affects the peripheral tissues (toes or fingers).



DIAGNOSIS

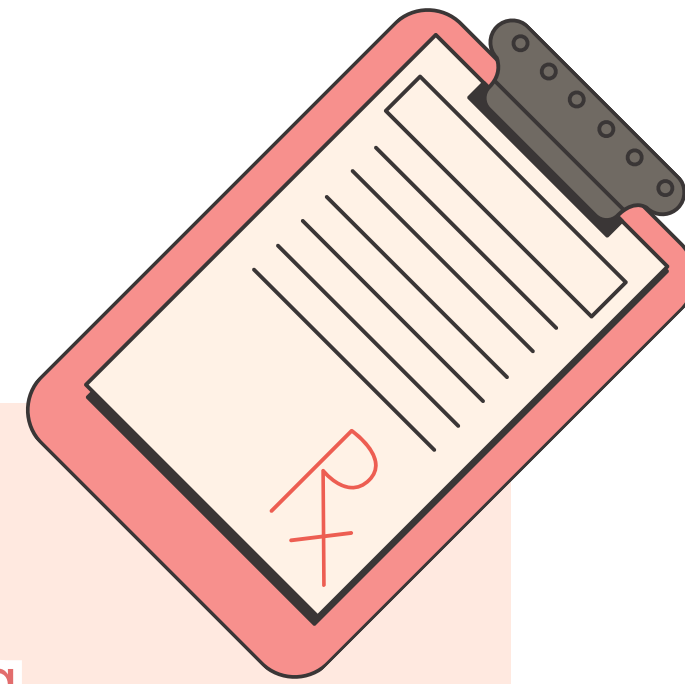
INVESTIGATIONS

MANAGEMENT



Created By : Omar Alkhamaiseh

DIAGNOSIS



History:

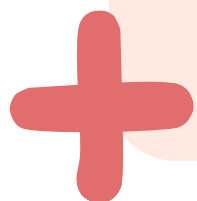
Most common presentation is a unilateral severe sudden leg pain especially in the calf and swelling

Some patients have no symptoms of thrombosis and may first present with signs of a pulmonary embolus, e.g. pleuritic chest pain, hemoptysis and shortness of breath

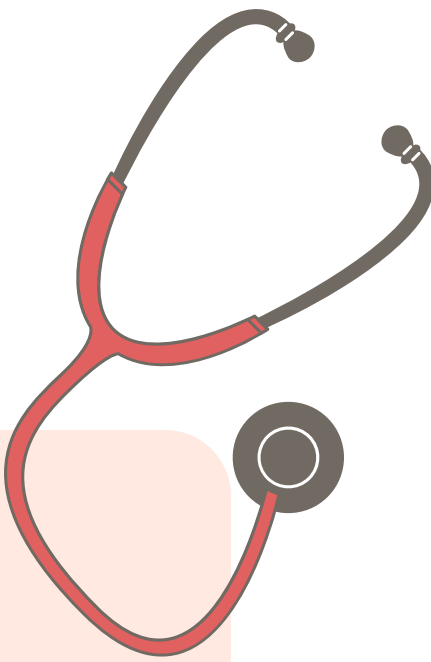
The second DVT can be silent, but typically the symptoms and signs occur during postoperative week, although they may occur earlier or later

Bilateral deep vein thromboses are common, occurring in up to 30 percent

When the swelling is bilateral, DVT must be differentiated from other causes of systemic edema such as hypoproteinemia, renal failure and heart failure



DIAGNOSIS



Physical Examination:

Swelling and mild pitting edema of the ankle

Dilated superficial veins

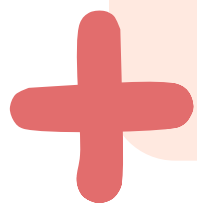
A stiff calf and tenderness

Pain in the calf

Raised skin temperature

Pulmonary Embolism: cyanosis, dyspnea, raised neck veins, a fixed split second heart sound and a pleural rub

If the pelvic veins or the femoral vein are affected, there is massive swelling of the whole lower limb



DIAGNOSIS

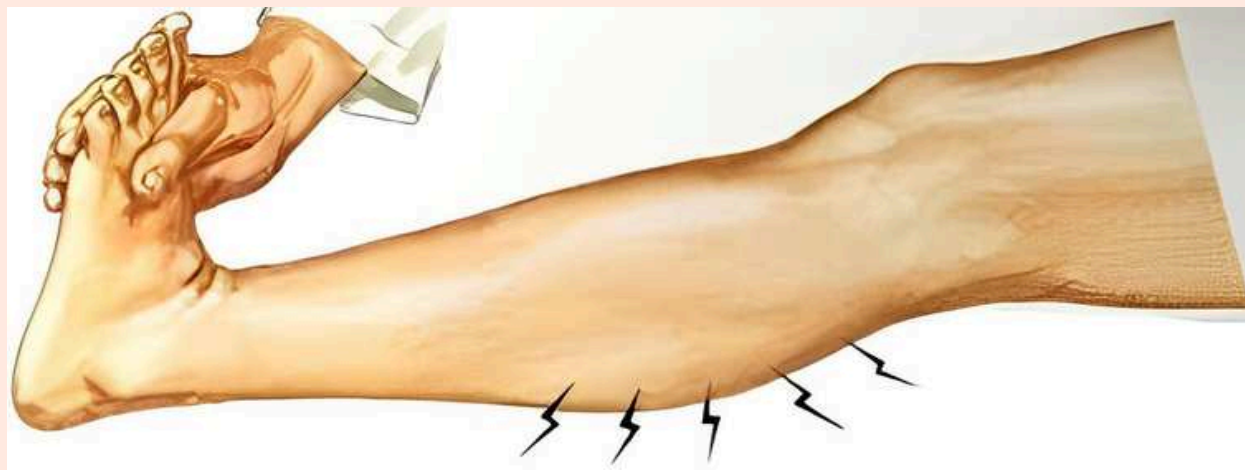
Physical Examination:

Homan's sign

Homan's sign is a physical examination procedure that is used to test for Deep Vein Thrombosis (DVT)

A positive Homan's sign is calf pain at dorsiflexion of the foot thought to be associated with the presence of thrombosis

The Homan's sign is classic yet insensitive test for DVT



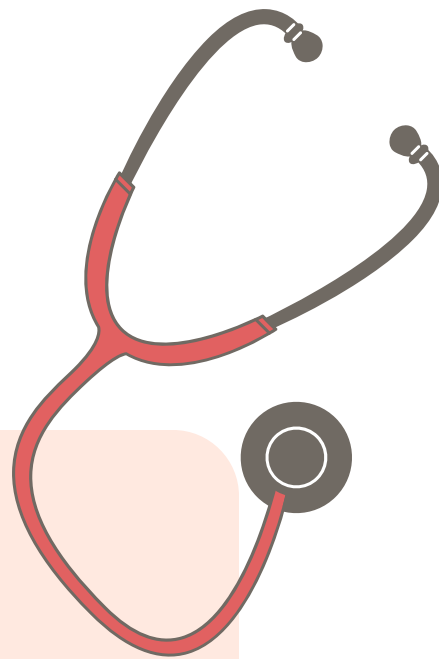
BACKGROUND

- * **CLINICAL FINDING of PAIN BEHIND KNEE upon FORCED DORSIFLEXION of FOOT**
- ~ DESCRIBED by AMERICAN SURGEON JOHN HOMANS in 1994
- ~ POSITIVE SIGN TRADITIONALLY THOUGHT to be CLINICAL SIGN of DEEP VEIN THROMBOSIS (DVT)

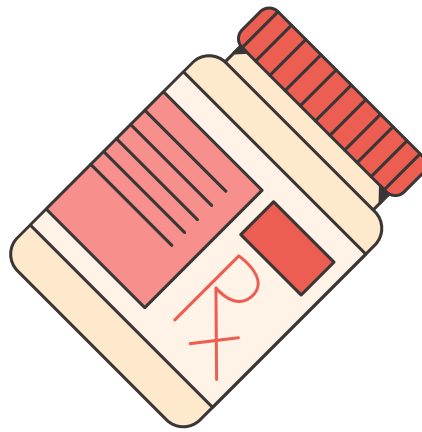
The diagram shows two steps of the Homan's sign test. Step 1 shows a leg with the knee flexed. Step 2 shows the foot being forced into dorsiflexion, with a red lightning bolt indicating pain behind the knee.

- 1 POSITION CLIENT'S KNEE in FLEXED POSITION
- 2 FORCIBLY & ABRUPTLY DORSIFLEX CLIENT'S ANKLE & OBSERVE for **PAIN BEHIND KNEE**

POSITIVE HOMAN SIGN



INVESTIGATIONS



The diagnosis of DVT and pulmonary embolus should be established by special investigations as the symptoms and signs are non-specific and may be absent

Well's criteria

The model should be applied only after a history and physical suggests that venous thromboembolism is a diagnostic possibility

D-DIMER

Blood work maybe done initially including a test called D-DIMER which detects clotting activity

D-Dimer is used as an initial screening test in the emergency department to diagnose patients who have signs, or symptoms suggestive of venous thromboembolism

D-dimer level $>2 \mu\text{g/ml}$ was found in patients with DVT

Sensitive not specific

Modified Wells criteria: clinical assessment for pulmonary embolism

Clinical symptoms of DVT (leg swelling, pain with palpation)	3.0
Other diagnosis less likely than pulmonary embolism	3.0
Heart rate >100	1.5
Immobilization (≥ 3 days) or surgery in the previous four weeks	1.5
Previous DVT/PE	1.5
Hemoptysis	1.0
Malignancy	1.0
Probability	Score
Traditional clinical probability assessment	
High	>6.0
Moderate	2.0 to 6.0
Low	<2.0
Simplified clinical probability assessment*	
PE likely	>4.0
PE unlikely	≤ 4.0

INVESTIGATIONS



ULTRASONOGRAPHY

Specificity of 98% for proximal DVT, 94% sensitivity and 75% specificity for distal venous thrombosis

In skilled hands, duplex scanning can detect thrombi in all the major veins at and above the knee, but is less reliable below this. It has the advantage that it is simple and non-invasive

ASCENDING VENOGRAPHY

Venography (also called phlebography or ascending phlebography) is a procedure in which an x-ray of the veins, a venogram, is taken after a special dye is injected into the bone marrow or veins

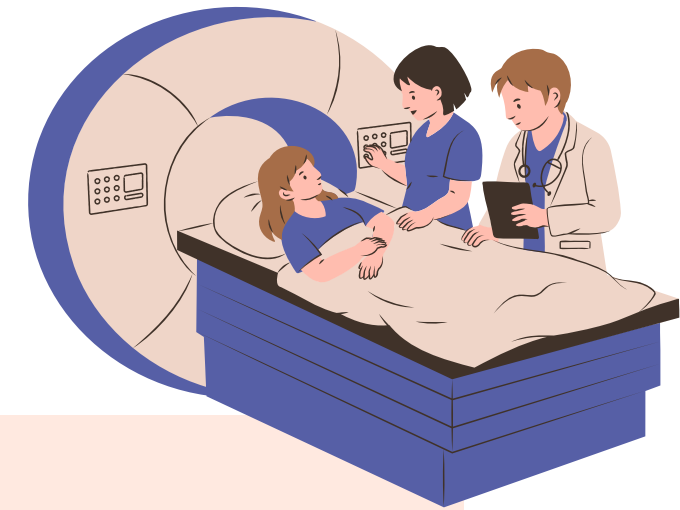
The dye has to be injected constantly via a catheter, making it an invasive procedure

It has been replaced by ultrasonography for extremity DVT

The figure on the right: Acute Thrombus is seen as a filling defect within the contrast-filled lumen



INVESTIGATIONS



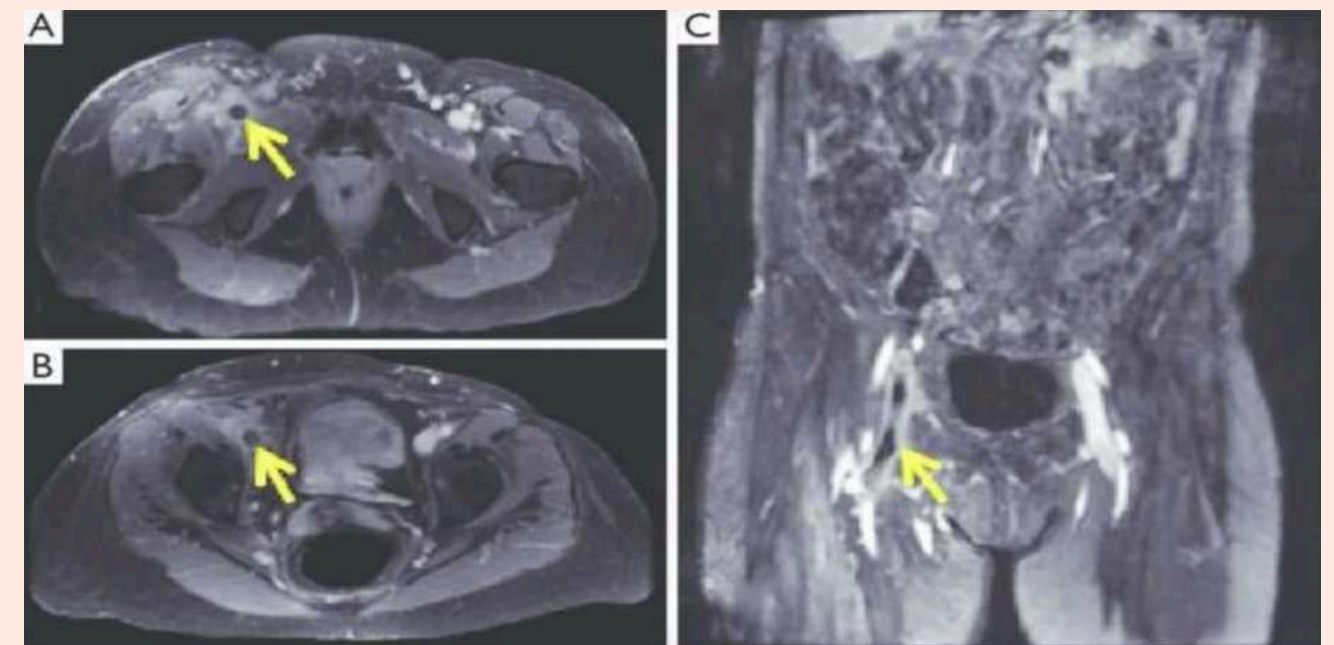
COMPUTED TOMOGRAPHY VENOGRAPHY

Allows visualization of central thoracic and abdomino-pelvic veins that are often obscured on ultrasound



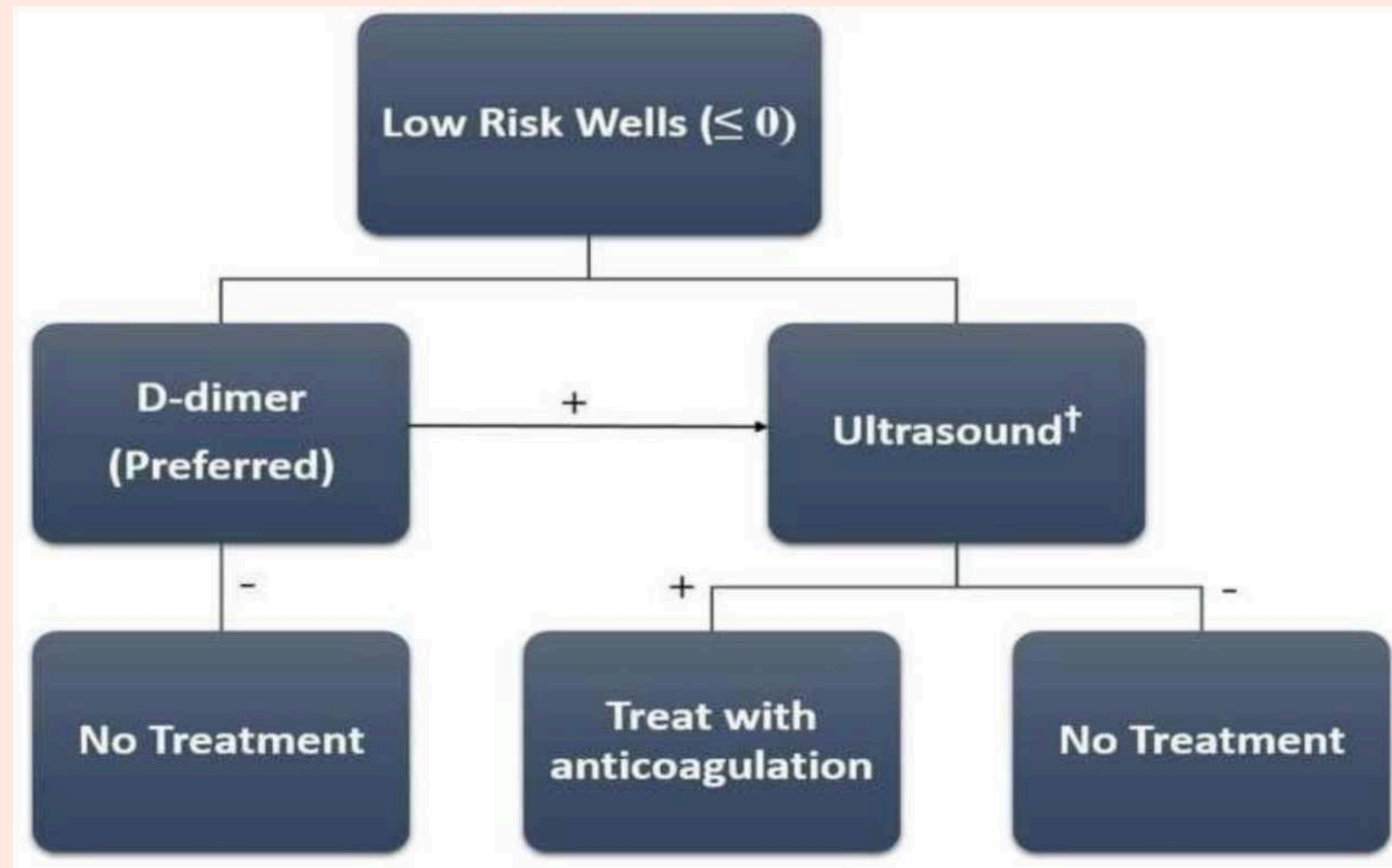
MAGNETIC RESONANCE VENOGRAPHY

An MRV uses magnetic resonance technology and intravenous contrast dye to visualize the veins



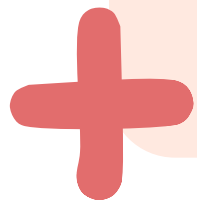
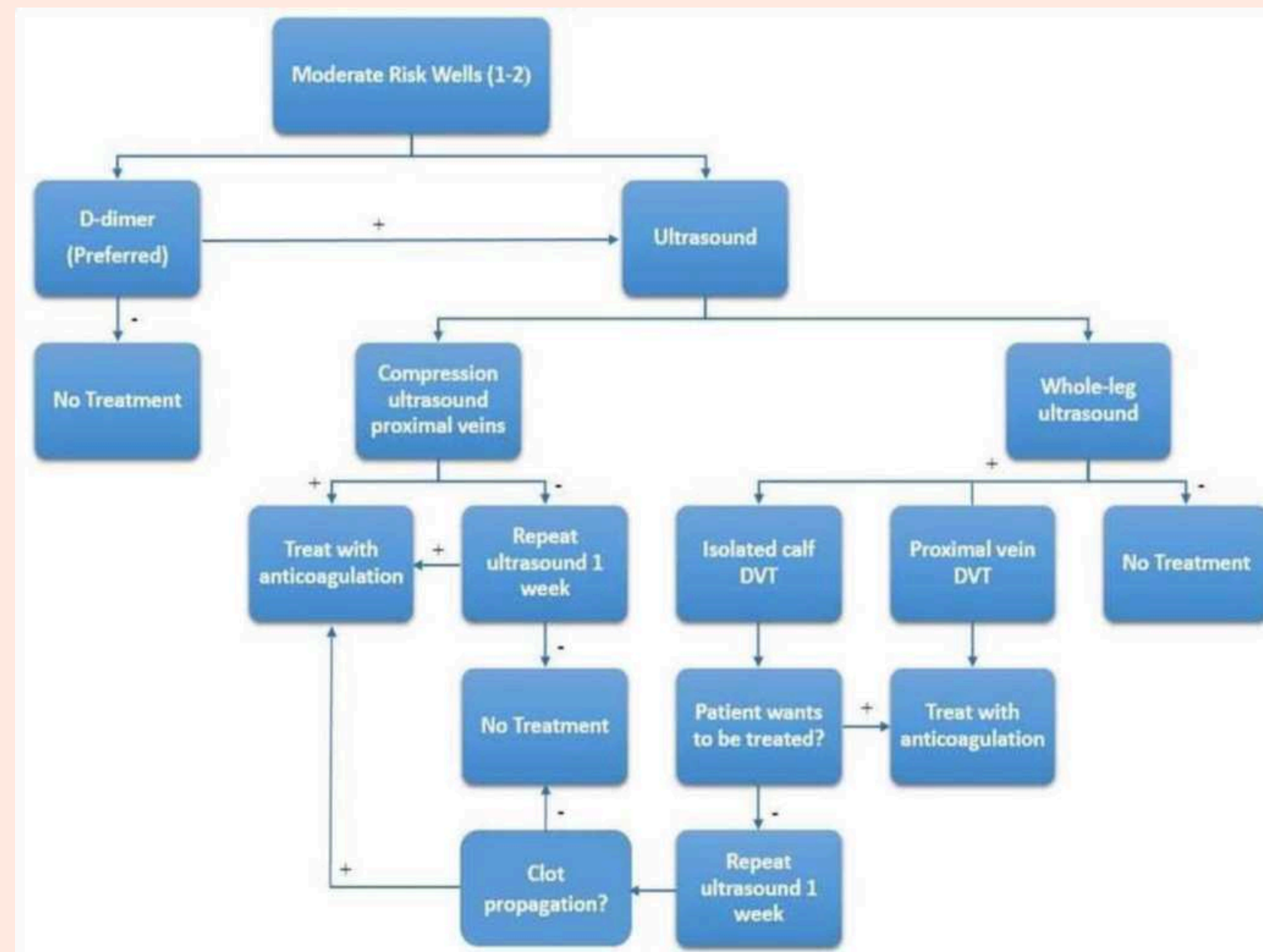
MANAGEMENT

Low Risk Wells



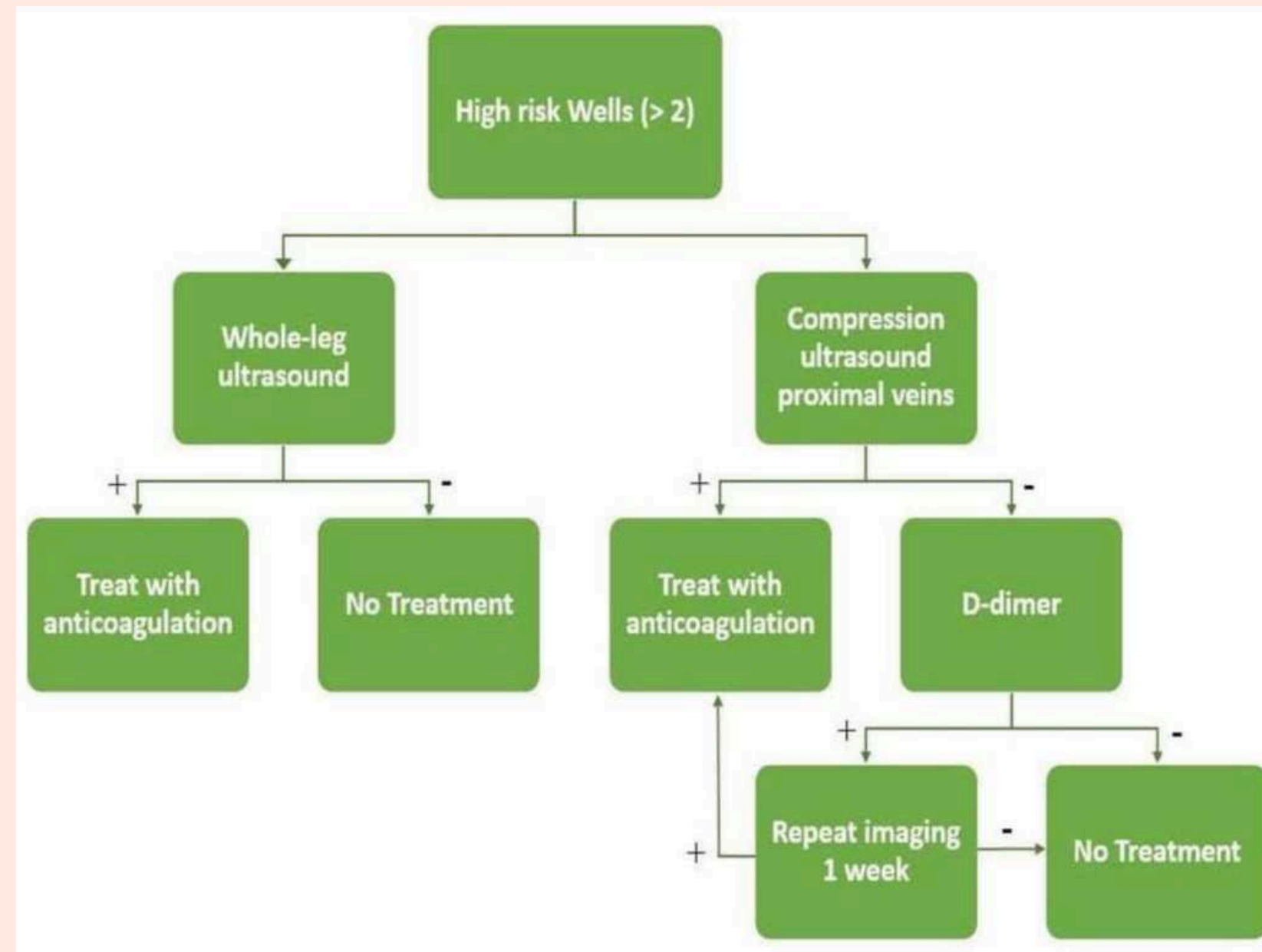
MANAGEMENT

Moderate Risk Wells



MANAGEMENT

High Risk Wells



COMPLICATIONS

- Post-phlebitic syndrome, also known as post-thrombotic syndrome, is a long-term complication that can occur after a deep vein thrombosis (DVT). This condition arises due to damage to the veins caused by the blood clot, leading to chronic venous insufficiency.
- Symptoms:
- Pain and heaviness: Often in the affected limb.
- Swelling: Persistent swelling in the leg.
- Skin changes: Discoloration, thickening.
- Ulcers: In severe cases, venous ulcers may form.
- secondary varicose veins



POST-PHLEBITIC LEG

- PULMONARY EMBOLISM (PE):OCCURS WHEN A BLOOD CLOT, OFTEN ORIGINATING FROM A DEEP VEIN THROMBOSIS (DVT) IN THE LEG, TRAVELS TO THE LUNGS AND BLOCKS A BLOOD VESSELS.
- SYMPTOMS :
- Shortness of breath: This can occur suddenly and worsen with physical activity.
- Chest pain: Often sharp and felt when breathing deeply, coughing, or bending.
- Cough: May produce bloody or blood-streaked mucus.
- Rapid or irregular heartbeat.
- Lightheadedness or dizziness.



Pulmonary embolism is diagnosed definitively by computed tomography (CT) scanning of the pulmonary arteries, which can show filling defects in the pulmonary arteries

PROPHYLAXIS

- Patients who are being admitted for surgery can be graded as low, moderate or high risk. Patients in the medium or high risk groups should be considered for anticoagulation prophylaxis.
- Prophylactic methods can be divided into mechanical and pharmacological.

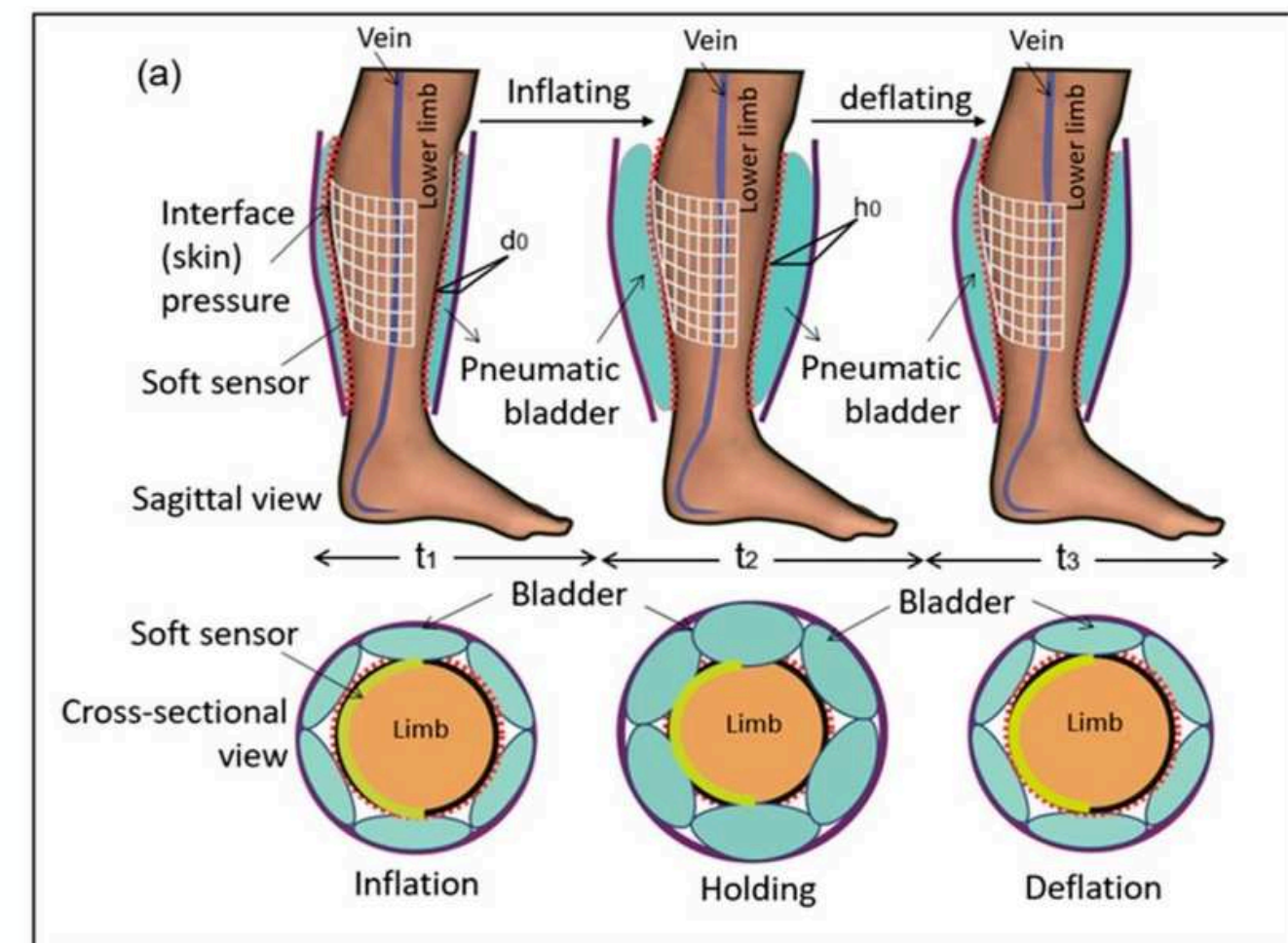
RISK GROUPS	
LOW	• Minor surgery <30 minutes. Any age. No risk factors. • Major surgery >30 minutes. Age <40. No other risk factors. • Minor trauma or medical illness, any age. No risk factors.
moderate	• Major surgery. Age 40+ or other risk factors. • Major medical illness: heart/lung disease, cancer, inflammatory bowel disease. • Major trauma/burns • Minor surgery, trauma, medical illness in patient with previous DVT, PE or thrombophilia.
high	• Major orthopedic surgery or fracture pelvis, hip, lower limb. • Major abdominal/pelvic surgery for cancer. • Major surgery, trauma, medical illness in patient with DVT, PE or thrombophilia. • Lower limb paralysis (e.g. stroke, paraplegia) • Major lower limb amputation

MECHANICAL METHODS

- Graduated compression stockings(GCS): The stockings work by
- exerting the greatest degree of compression at the ankle ,with the level of compression gradually decreasing up the garment.
- The pressure created by the stockings pushes fluid up the leg, which allows blood to flow freely from the legs to the heart. Compression stockings not only improve blood flow, but also reduce swelling and pain.



- Intermittent pneumatic compression (IPC)
- The devices use cuffs around the legs that fill with air and squeeze your legs. This increases blood flow through the veins of your legs and helps prevent blood clots.



Pharmacological methods

- Pharmacological methods are more effective than mechanical methods at risk reduction although they carry an increased risk of bleeding. In the past, low-dose unfractionated heparin was used both intravenously and subcutaneously. Most patients now start on low molecular weight heparin given subcutaneously, with the dose based on the patient's weight. This does not require monitoring and has a reduced risk of heparin-induced thrombocytopenia. It can be given once a day and has a lower risk of bleeding complications. Unfractionated heparin and warfarin are now rarely used in the prophylaxis of deep vein thrombosis. A combination of mechanical and pharmacological treatment with heparin can be used in patients considered at high risk.

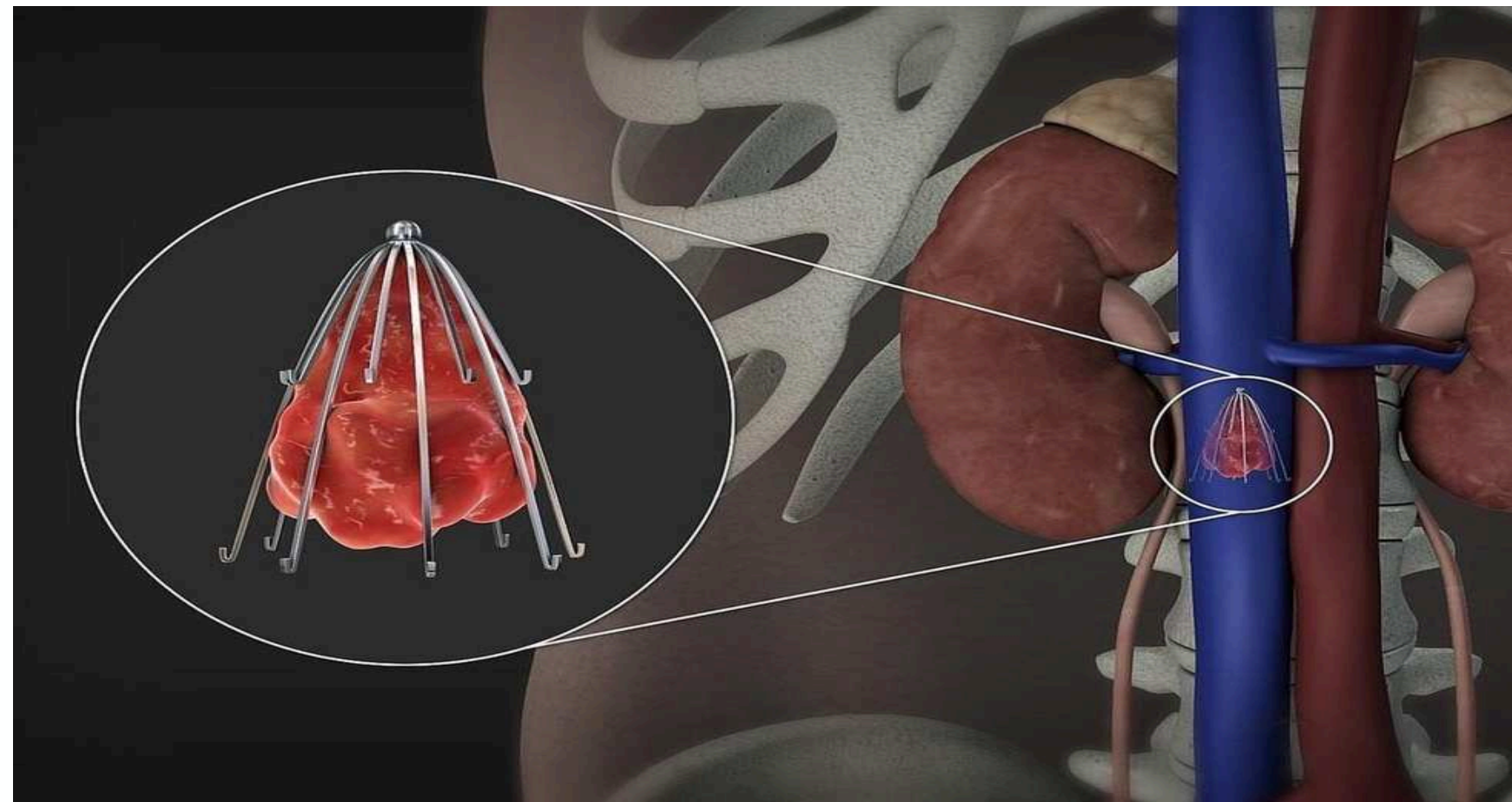
TREATMENT

- **Antithrombotic Therapy:** Patients who are confirmed to have a deep vein thrombosis on duplex imaging should be started on IV or subcutaneous (SC) unfractionated heparin or SC low molecular weight heparin. Fondaparinux, a synthetic pentasaccharide, is sometimes also used as an alternative to heparin to initiate therapy. An oral vitamin K antagonist, usually sodium warfarin, is begun shortly after initiation of IV or SC therapy. Either SC or IV therapy is continued until effective oral anticoagulation with warfarin is achieved as indicated by an international normalized ratio (INR) ≥ 2 for 24 hours. A minimum of 5 days of heparin or fondaparinux therapy is recommended. Recently, the U.S. Food and Drug Administration (FDA) has also approved alternative oral anticoagulants for both treatment and prophylaxis for VTE.

- **Systemic and Catheter-Directed Thrombolysis:** Patients with extensive proximal, iliofemoral DVT may benefit from systemic thrombolysis or catheter-directed thrombolysis (CDT). CDT appears to be more effective (see later in chapter) and potentially reduces acute congestive lower extremity symptoms more rapidly than anticoagulation alone and decreases the development of post-thrombotic syndrome (PTS).
- Several thrombolytic agents are available, including streptokinase, urokinase, alteplase (recombinant tissue plasminogen activator), reteplase, and tenecteplase.

All share the ability to convert plasminogen to plasmin, which leads to the degradation of fibrin. They differ with regard to their half-lives, their potential for inducing fibrinogenolysis (generalized lytic state), their potential for antigenicity, and their FDA-approved indications for use.

- Inferior Vena Cava (IVC) filters :are small, wiry devices placed in the inferior vena cava. These filters are designed to catch blood clots and prevent them from traveling to the lungs, where they could cause a pulmonary embolism.
- Placement of an IVC filter is indicated for patients who have manifestations of lower extremity VTE and absolute contraindications to anticoagulation, those that have a bleeding complication from anticoagulation therapy of acute VTE, or those who develop recurrent DVT or PE despite adequate anticoagulation therapy and for patients with severe pulmonary hypertension.



- Operative Venous Thrombectomy: a surgical procedure used to remove a blood clot (thrombus) from a vein.
- Surgical therapy is generally reserved for patients who worsen with anticoagulation therapy and those with phlegmasiaceruleadolens and impending venous gangrene.

This is a real case we observed in hospital (icu)

she has bilateral dvt and pe
also she has a pyelonephritis .

Diagnosis: Bilateral DVT + Pyelonephritis Today's Date: 4.10.2024
Massive PE

MEDICATIONS/ INTRAVENOUS SOLUTIONS										
Routine Medications										
Order date	Name of Medication	Dose	Route	Freq- uency	Time Init.	Time Init.	Time Init.	Time Init.	Time Init.	Time Init.
3.10	Hydrocortisone	100mg	IV	3	08:00					
3.10	Lasix	40mg	IV	2	08:00					
3.10	Slow-K	80mg	PO	3	08:00	15:00	20:00			
3.10	Atrevent	200	NEB	4	08:00					
3.10	Takenic	750	IV	2	08:00					
3.10	Meropenem	2g	IV	3	08:00					
RN & STAT Medications (including all IV drips)										
Order date	Name of Medication	Dose	Route	Freq- uency	Time Init.	Time Init.	Time Init.	Time Init.	Time Init.	Time Init.
3.10	Nasacort	3mg / 50ml	GIW							
3.10	Heparin	25,000 / 250cc	N.S							
3.10	Morphine	50mg / 50cc	N.S							
I.V Fluids & Blood and blood product										
Order date										Time Hung
3.10	Glyc 500 + 100Pan									
3.10	Glyc 500 + 100Pan									
3.10	Glyc 500 + 100Pan									



CASES:

A 62-year-old male presented to the emergency department with complaints of swelling and pain in his left calf for the past three days. The patient reported that the pain worsened with movement, and he had difficulty walking due to the discomfort. He also noticed some redness and warmth over the affected area.

History:

The patient had undergone hip replacement surgery two weeks ago and had been discharged with instructions to use compression stockings and remain as active as possible. He had been mostly immobile due to post-operative pain.

dx: DVT in a Post-Surgical Patient

A 28-year-old female presented to the clinic with a one-week history of swelling, pain, and tenderness in her right leg. The symptoms were gradual in onset and became progressively worse. She also reported a similar episode six months ago, which resolved with anticoagulation treatment.

History:

The patient had been on oral contraceptive pills (OCPs) for birth control for the past two years. She was otherwise healthy, with no known clotting disorders or recent surgeries. Her previous episode of DVT was in the left leg, which resolved after three months of anticoagulation therapy. There was a family history of thrombosis, as her mother had experienced a blood clot during pregnancy.

dx: Recurrent DVT in a Young Female on Oral Contraceptives

THANK YOU

وَأَخِرُ دَعْوَاهُمْ أَنِ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ

https://youtu.be/iQjTClcusCs?si=HdK_YRvz6DlCqtvZ

