



มหาวิทยาลัยราชภัฏนครปฐม



Mechanism and Illness of Human Body 2

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Disorders of the Cardiovascular System (part 1)

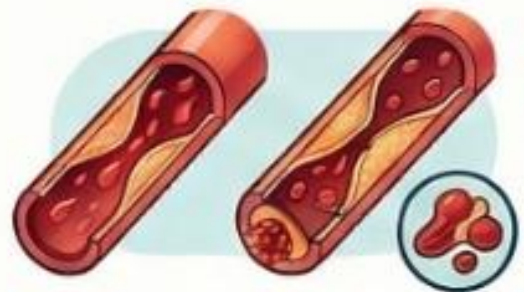


A Comprehensive Overview of Cardiovascular Conditions

Vascular and Pressure Disorders



Arterial and Venous Abnormalities



Arterial and Venous Abnormalities

Structural or functional disorders affecting the vessels that carry blood throughout the body.

Hypertension (High Blood Pressure)

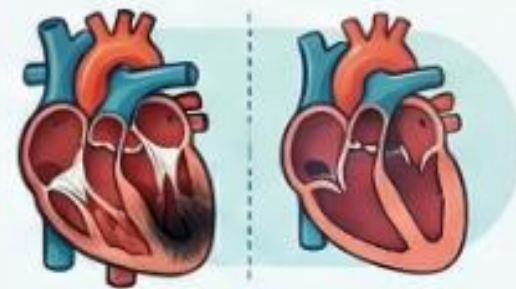


A chronic condition where the force of the blood against artery walls is too high.

Cardiac Conditions and Critical States



Ischemic and Congenital Heart Diseases



Ischemic and Congenital Heart Diseases

Covers reduced blood flow to heart muscles and structural defects present from birth.



Heart Failure and Shock



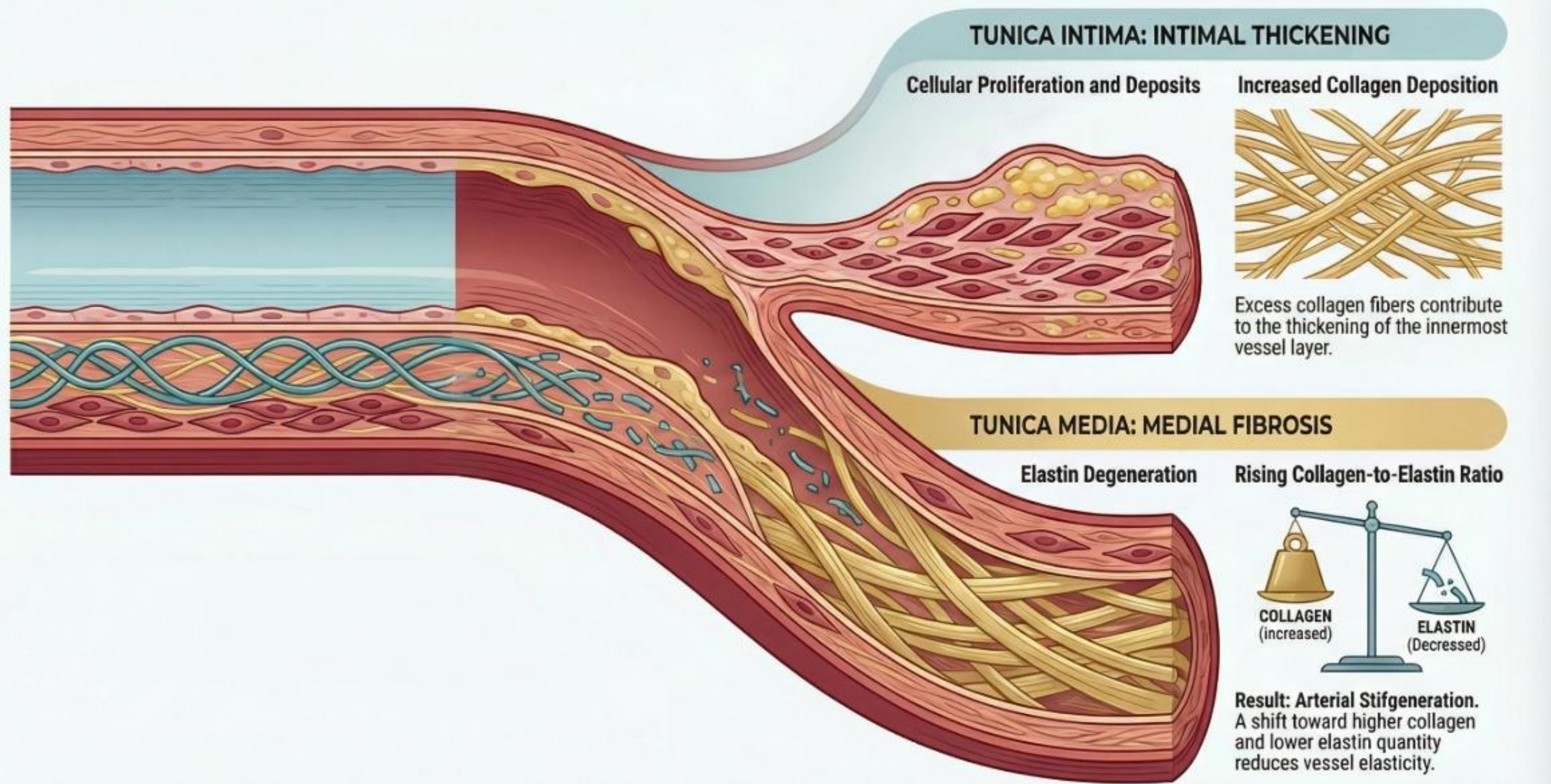
Heart Failure
Critical state where the heart cannot pump sufficiently.

Shock
The circulatory system collapses.

Arteriosclerosis



ARTERIAL AGING: STRUCTURAL AND BIOCHEMICAL TRANSFORMATION



Risk Factors for Atherosclerosis

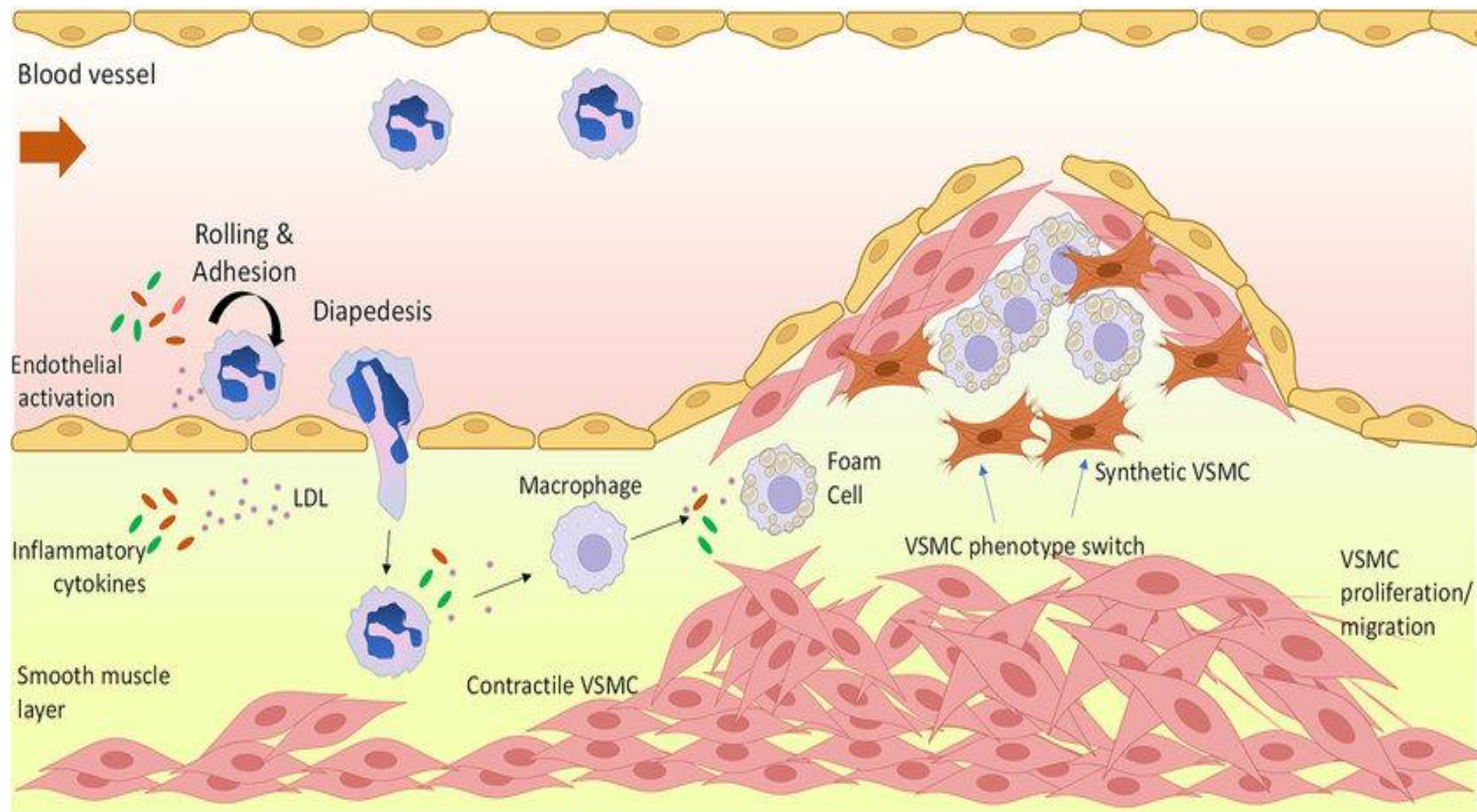
Non-modifiable Risk Factors

- Advanced age
- Genetic predisposition (heredity)

Modifiable Risk Factors

- Obesity
 - Physical inactivity
 - Psychological stress
- Hypertension
- Dyslipidemia:
 - ↑ Total cholesterol
 - ↑ Triglycerides
 - ↑ Low-density lipoprotein (LDL)
- Cigarette smoking

Arteriosclerosis pathophysiology



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Endothelial injury



LDL infiltration → Oxidized LDL



Macrophage uptake → Foam cell



Fatty streak



**Smooth muscle migration +
collagen formation**



Fibrous plaque



Calcification → Arterial narrowing

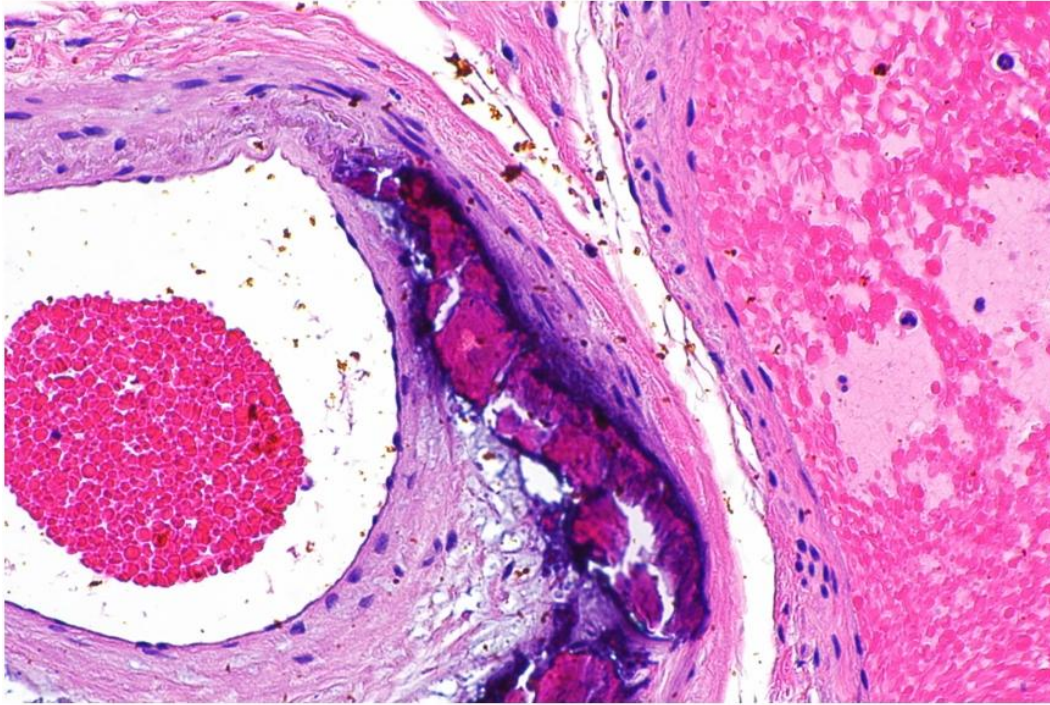


**Plaque rupture → Thrombus
→ Occlusion**

Arteriosclerosis



Monckeberg's sclerosis (Medial calcific sclerosis)



Pathological Changes

- Swelling and degeneration of the tunica media
- Degeneration and fragmentation of smooth muscle cells
- Calcium deposition associated with fibrosis
- Arteries become rigid and pipe-like in appearance

Common Sites

- **Medium-sized arteries**
- Upper and lower extremities (arms and legs)

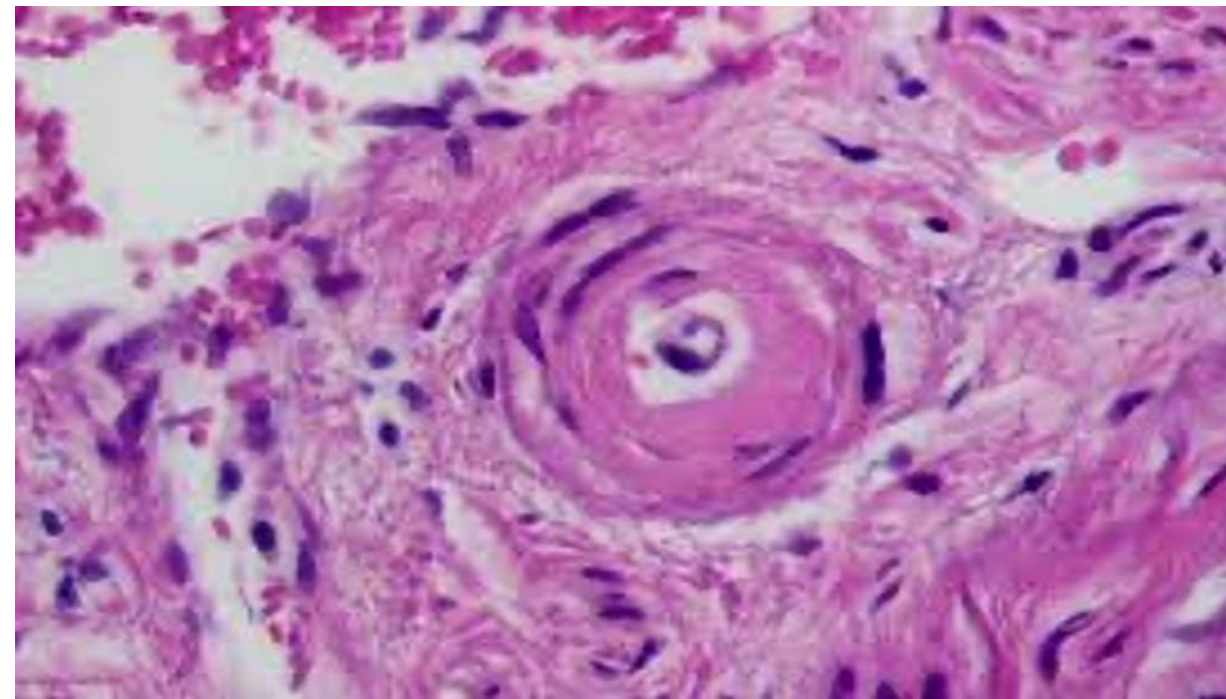
Population at Risk

- Elderly individuals

Hemodynamic Impact

- If atherosclerosis is absent,
 - no significant luminal narrowing
 - no major impairment of blood flow or vascular obstruction

Arteriolar sclerosis



Pathological Features

- Thickening and hardening of the arteriolar wall
- Narrowing of the vascular lumen
- Reduced blood supply to peripheral tissues

Common Sites

- Small arteries and arterioles

Population at Risk

- Patients with hypertension
- Elderly individuals

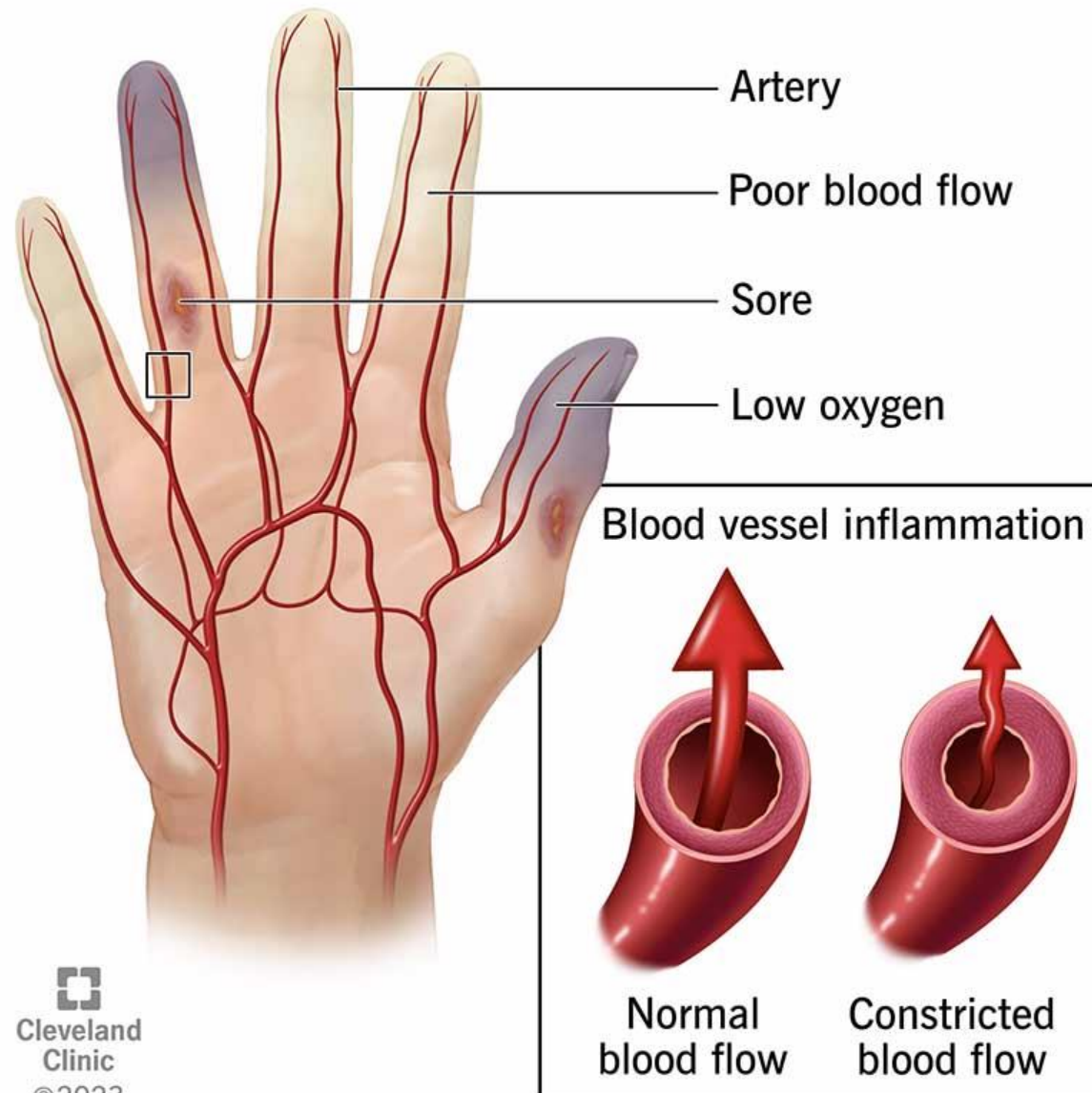
Clinical Impact

- Chronic tissue ischemia
- End-organ damage (kidney, brain, retina)

Arteritis



Buerger's Disease *Thromboangiitis obliterans*



Vessels Involved

- Small and medium-sized arteries
- May also involve **superficial veins** and **adjacent nerves**

High-Risk Population

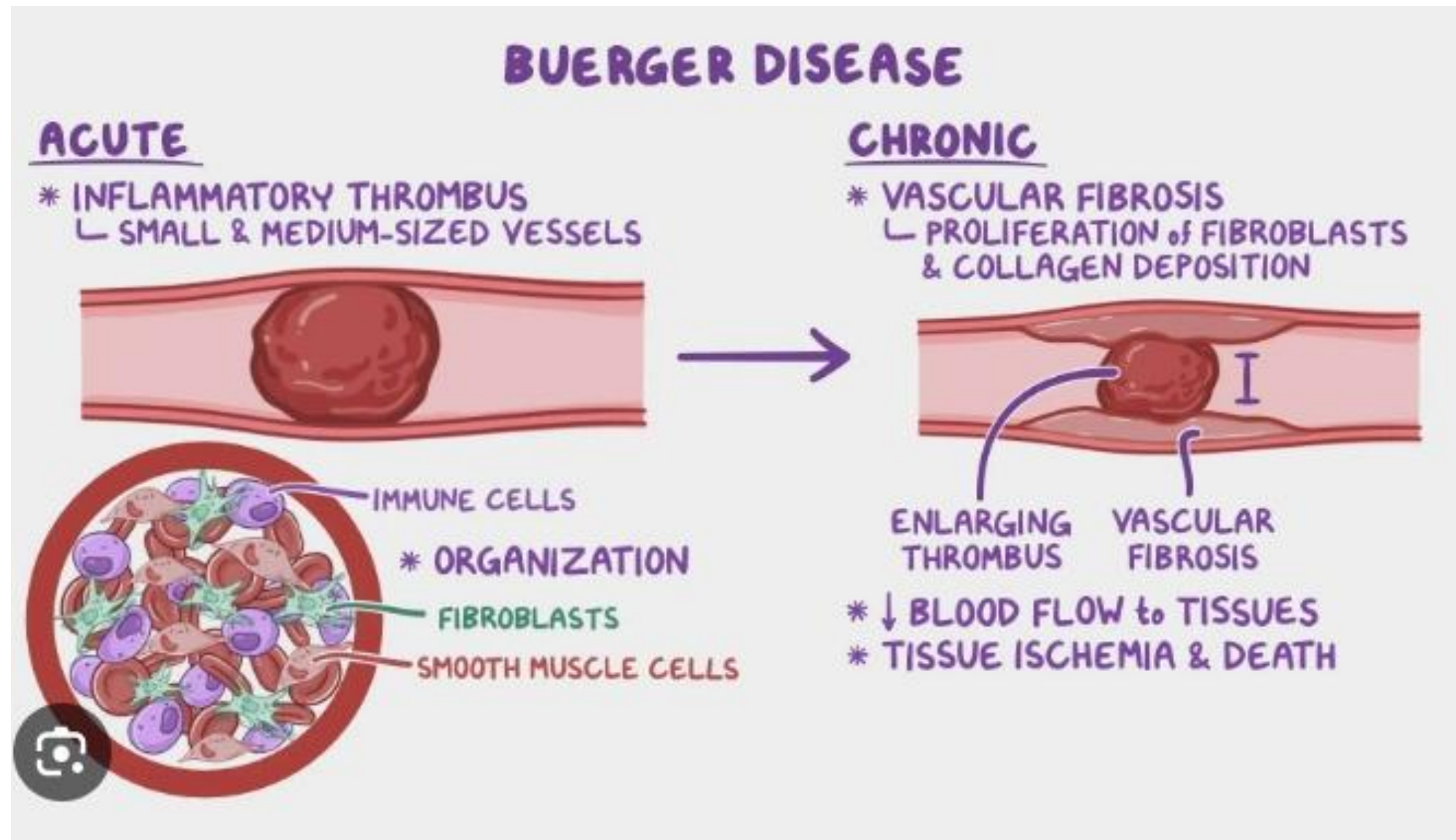
- Young male smokers (≤ 40 years old)
- Older females
- Strong association with heavy cigarette smoking

Common Sites

Lower extremities more than upper extremities

- Popliteal artery
- Tibial artery
- Plantar artery
- Digital branches

Arteritis pathophysiology



Pathophysiological Features

- Associated with autoimmune-mediated vascular injury
- Inflammation involves all layers of the vessel wall
- Vasospasm (arterial constriction)
- Extension to adjacent veins and peripheral nerves
- Segmental and localized involvement
- Formation of intraluminal thrombus

Inflammatory Cell Infiltration

Early stage: Predominantly **neutrophils**

Late stage: **Lymphocytes, plasma cells, and macrophages**

Elastic Lamina Changes

- No primary inflammation
- Progressive destruction of elastic lamina

Consequences of Vascular Occlusion

- Development of collateral and anastomotic vessels
- Chronic tissue ischemia

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Arteritis

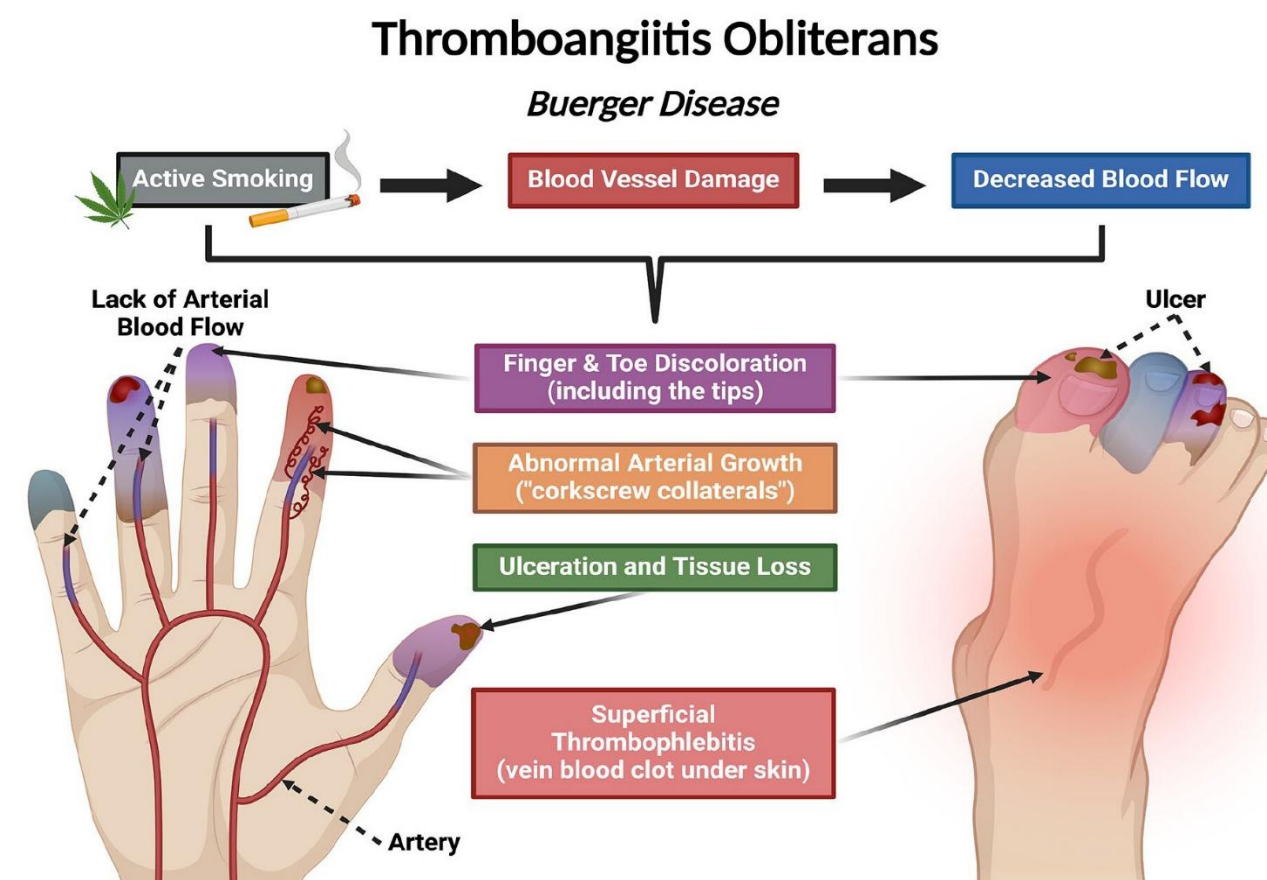


Early Stage Symptoms

- **Intermittent claudication** (pain during activity or exercise)
 - Increased oxygen demand by muscles
 - Arterial obstruction → decreased tissue oxygen supply
- Cold skin temperature
- Diminished or absent peripheral pulses
- Delayed wound healing
- Hair loss, dry and fragile skin, brittle nails

Advanced Stage Symptoms

- **Rest pain** (pain even at rest)
- Changes in skin color and temperature
- Severe numbness
- Critical limb ischemia
 - May lead to tissue necrosis and gangrene



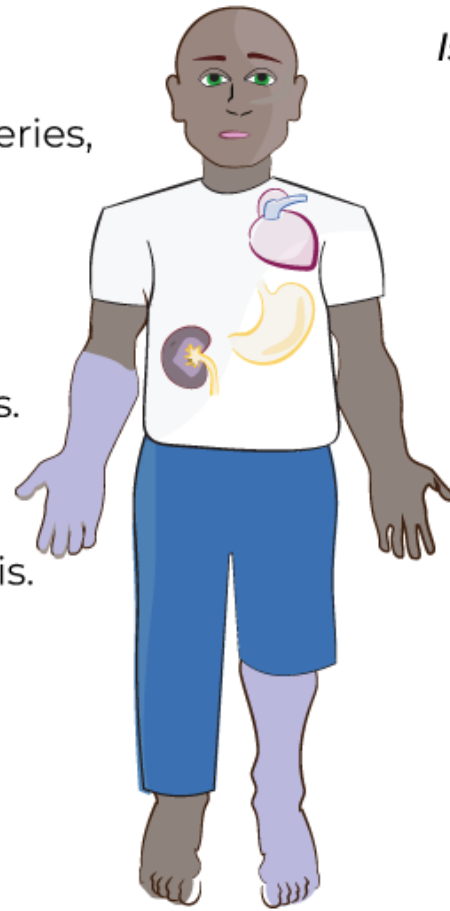
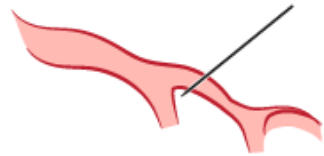
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Arteritis



Polyarteritis nodosa NECROTIZING INFLAMMATION

- Medium muscular arteries, esp. at branch points.
- Systemic or cutaneous.
- Secondary forms are related to HBV, HBC, or Rheumatoid arthritis.
- Men > 50 y.o.



Ischemia affects:

NERVOUS SYSTEM

Mononeuritis multiplex or asymmetric polyneuropathy.
Median, ulnar, fibular nerves;
Sensory and motor deficits.

RENAL

Hypertension, oliguria,
may lead to renal failure.

GI

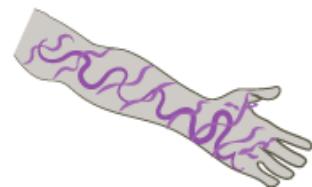
Abd. pain, malabsorption;
aneurysm poss. fatal.

HEART

Heart failure

SKIN

Livedo reticularis



Ulcers



Subcutaneous nodules



Gangrene



Vessels Involved

- **Small and medium-sized arteries**
- Commonly occurs at **vascular bifurcation and branching sites**

Epidemiology

- More common in **males**
- **Age group: 20–45 years**

Etiology

- May be associated with **infectious processes**
- Possibly related to **immune-mediated mechanisms**
 - **Autoimmune reactions**
 - **Immune complex deposition**

Pathophysiology

- **Inflammation of the vessel wall**
 - **Endothelial injury**
 - **Luminal narrowing and thrombosis**
- **Reduced tissue perfusion and ischemia**

Arteritis



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Common Systemic Symptoms

- Prolonged fever
- Myalgia (muscle pain)
- Fatigue
- Unintentional weight loss

Ischemic Symptoms (Depend on Affected Organs)

- Ischemic pain
- Children:
 - Muscle and joint pain
 - Abdominal pain due to **intestinal ischemia**

Cutaneous Manifestations

- Painless skin rash
- Palpable purpura
- Livedo reticularis (net-like skin discoloration)
- Tender subcutaneous nodules
- Chronic ulcers and tissue necrosis

Cardiovascular and Renal Manifestations

- Hypertension
- Renal involvement:
 - Hematuria
 - Proteinuria

Neurological Manifestations

- Peripheral neuropathy
- Sensory and motor deficits

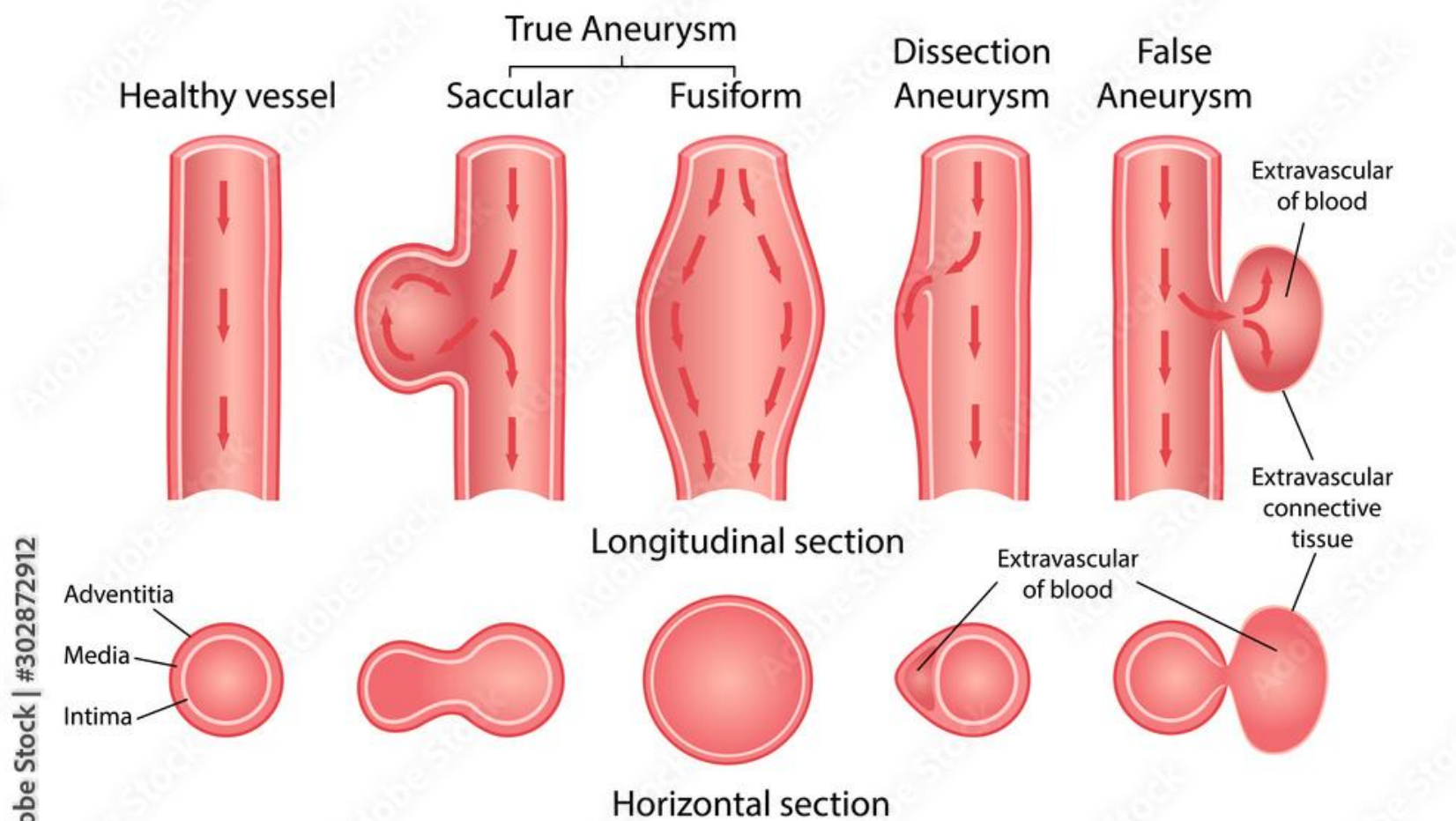
Laboratory Findings

- Elevated white blood cell count
- Evidence of systemic inflammation

Aneurysm



Types of Aneurysm



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Definition

- Outpouching or abnormal enlargement of the arterial wall
- Caused by weakening of the vessel wall structure
- May be:
 - Localized and small
 - Large and extensive dilation

Etiology (Causes)

- Age-related arteriosclerosis
- Hypertension
- Syphilis
- Trauma
- Infection of the arterial wall (mycotic aneurysm)

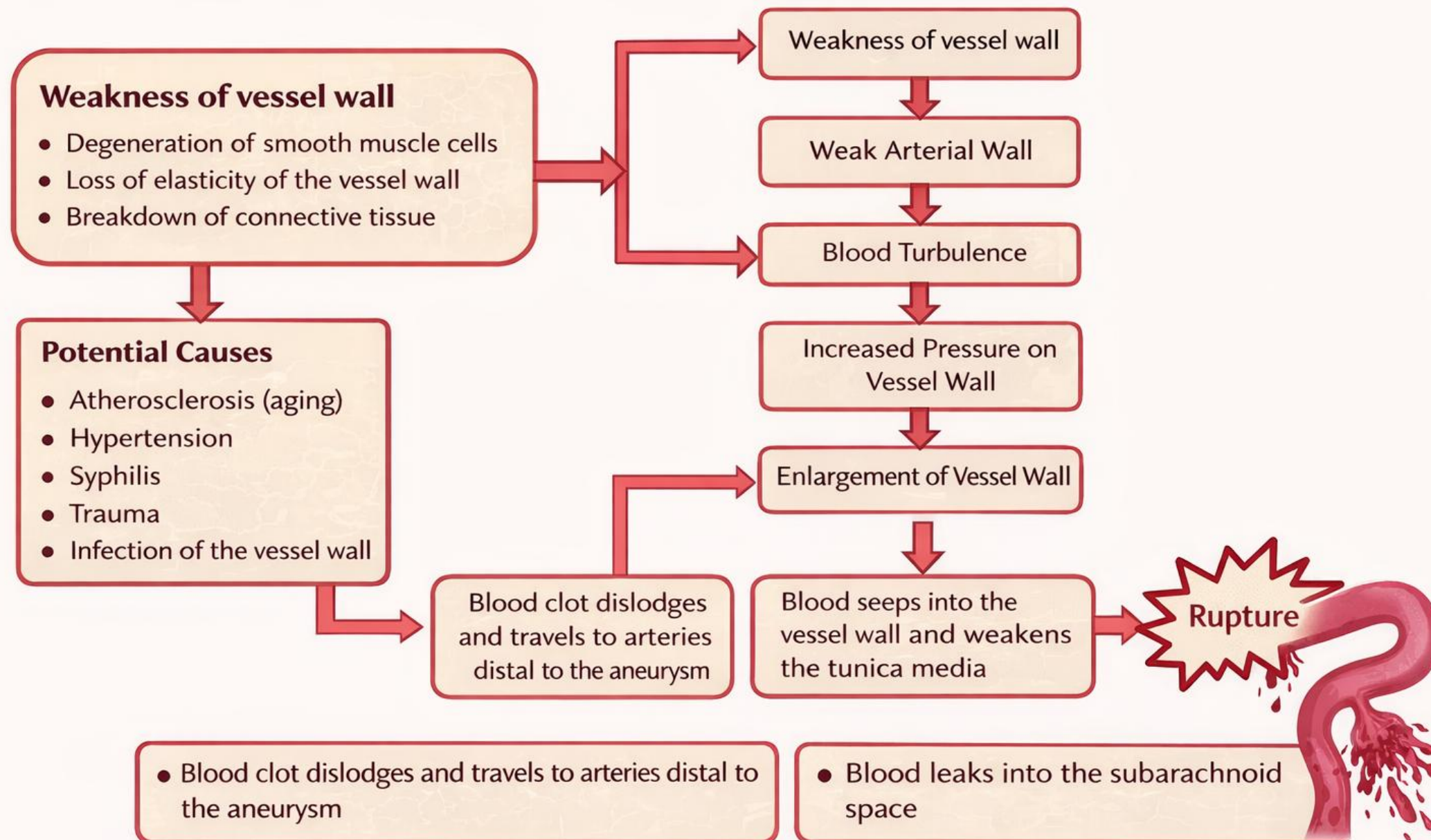
Pathophysiologic Impact

- Progressive vessel wall weakening
- Increased risk of rupture, hemorrhage, and thrombosis

Aneurysm



Pathophysiology of Aneurysm



Clinical Manifestations of Aneurysm

Local Signs

- **Palpable pulsatile mass**

(a mass that expands and contracts with the pulse)

Compression Symptoms (Due to Pressure on Adjacent Structures)

- **Dyspnea (difficulty breathing)**

→ Compression of the **trachea**

- **Dysphagia (difficulty swallowing)**

→ Compression of the **esophagus**

- **Chronic cough**

→ Irritation of **nearby nerves**

- **Chest pain**

→ Pressure on the **thoracic bones and surrounding tissues**

Cardiac-Related Symptoms

- **Chest pain**

- **Other symptoms of heart disease**

Venous thrombosis



Definition

- Formation of thrombi (blood clots) within blood vessels
- Thrombi adhere to the inner lining (endothelium) of the vessel wall

Vessels Involved

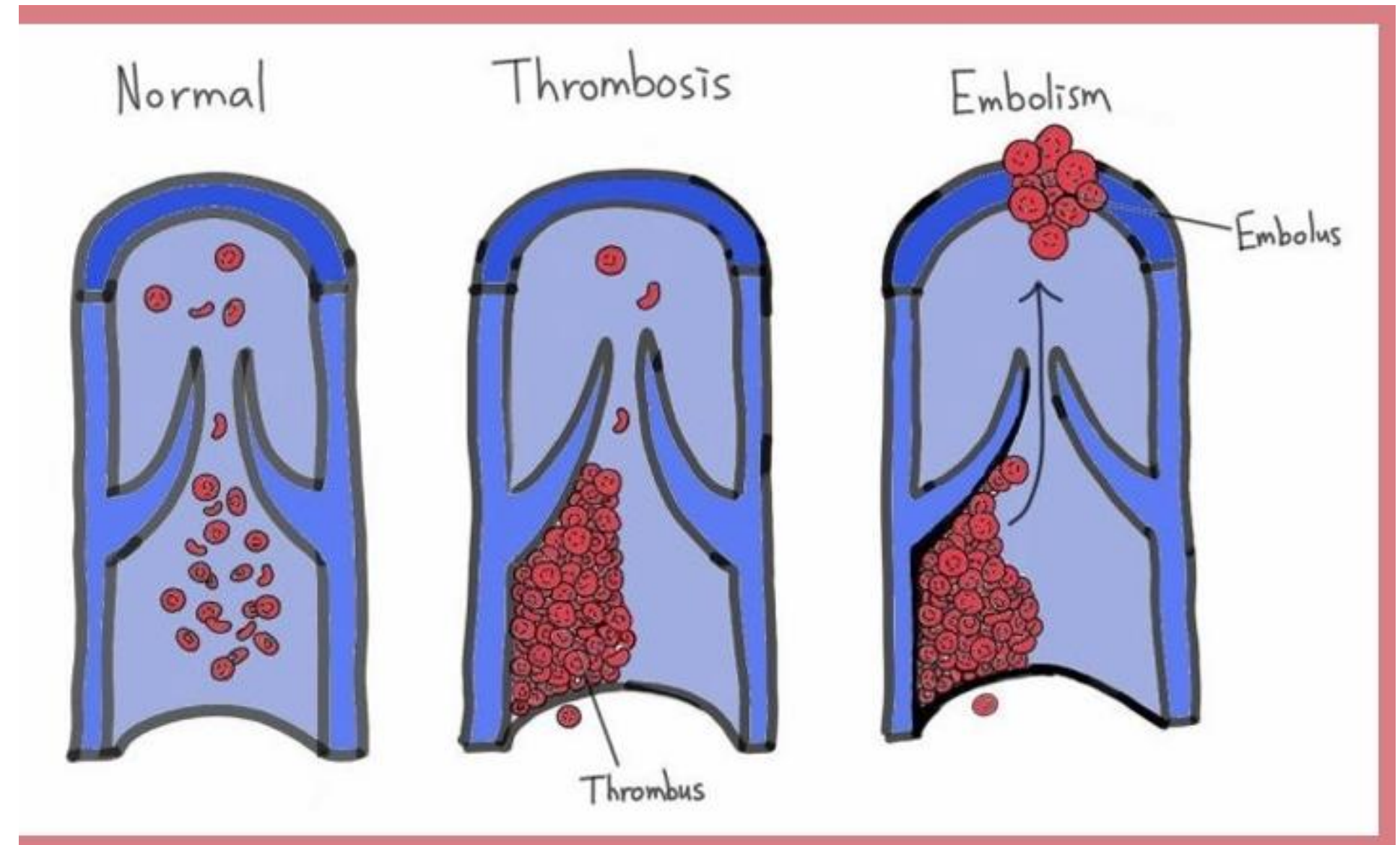
- Occurs in **both veins and arteries**

Pathophysiology

- **Endothelial injury due to trauma**
 - triggers **inflammation**
 - promotes **thrombus formation (thrombosis)**
 - may progress to **inflammation of the vein (phlebitis)**

Common Sites

- **Deep veins of the lower extremities, including:**
 - **Iliac vein**
 - **Popliteal vein**
 - **Saphenous vein**



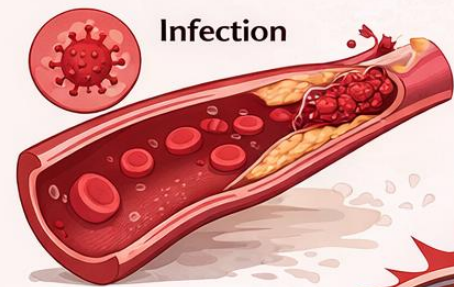
Venous thrombosis



Major Causes of Thrombosis

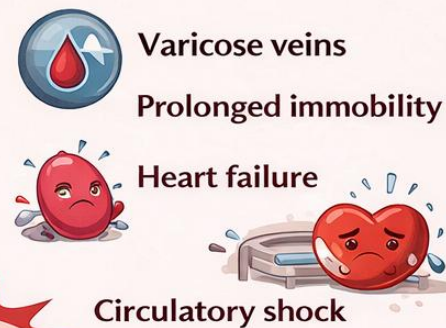
1. Endothelial Injury

Damage to the inner lining of blood vessels makes it easy for blood to clot on the vessel wall.



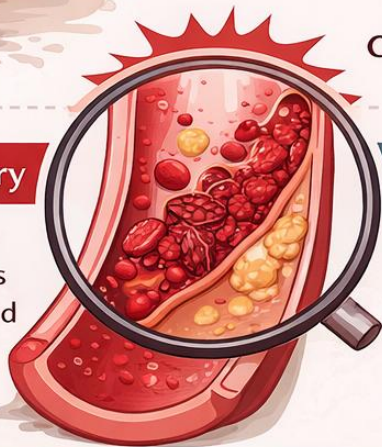
2. Abnormal Blood Flow

Slow or stagnant blood flow leads to faster clot formation.



1. Endothelial Injury

Damage to the inner lining of blood vessels makes it easy for blood to clot on the vessel wall.

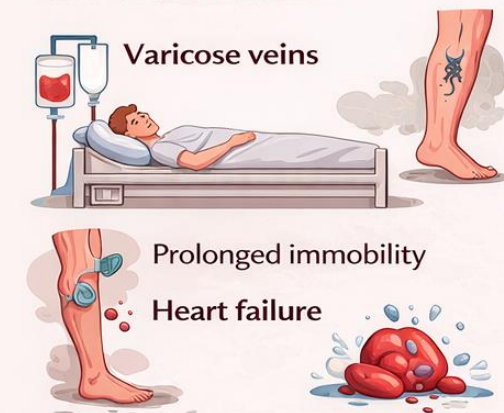


3. Hypercoagulability

Increased tendency for blood to clot due to a deficiency of natural anticoagulants.

2. Abnormal Blood Flow

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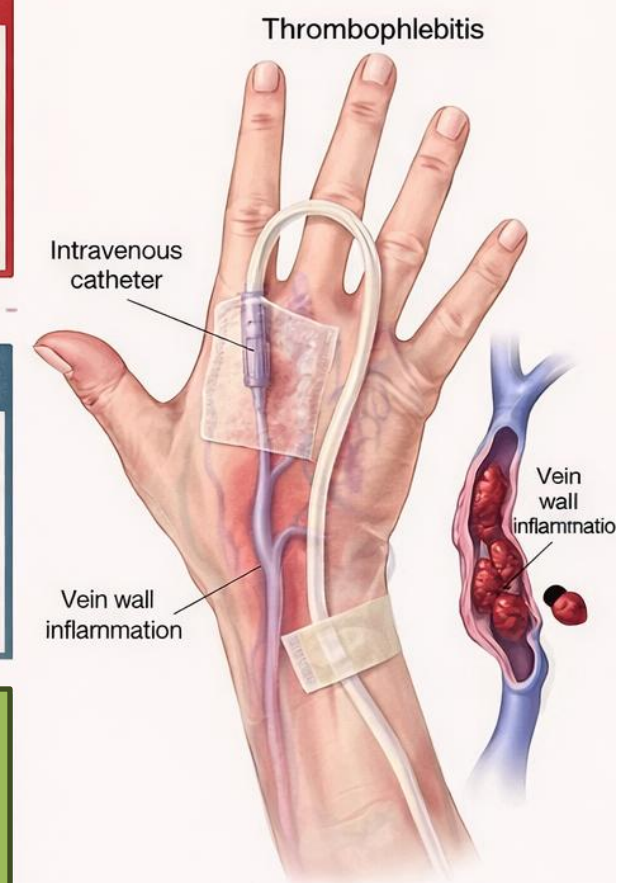
Venous Thrombosis

1. Thrombophlebitis

- Inflammation of a superficial vein with thrombus attached to the inner wall
- **Causes:** Often due to infection or trauma
- **Common location:** Leg
- **Symptoms:** Inflammation, swelling, muscle tenderness, and pain

2. Phlebothrombosis

- Thrombus formation without vein inflammation
- **Causes:** Hip fracture, major surgery
- **Common location:** Vein of leg or pelvis
- **Symptoms:** Swelling or no symptoms (asymptomatic)



Varicose vein

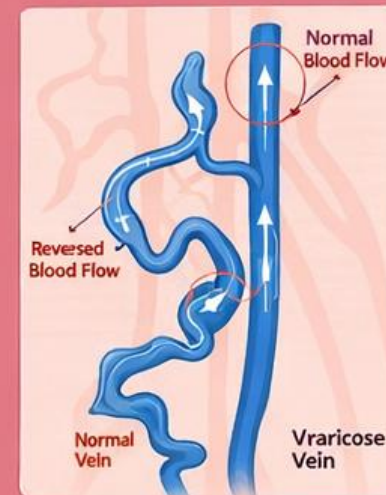


Varicose Veins

- Condition involving the dilation and twisting of superficial veins.
- Commonly found in the lower extremities.

Causes:

- Incompetent vein valves, preventing normal blood flow
- Increased pressure within veins
- More common in women than men (4 times higher)
- Chronic venous insufficiency: **advanced varicose veins**



Causes of Varicose Veins

Primary Varicose Veins

- Occur spontaneously (idiopathic)
- Involve superficial veins
- Can be found from a young age
- Associated factors:
 - Family history
 - Pregnancy
 - Prolonged standing
 - Obesity

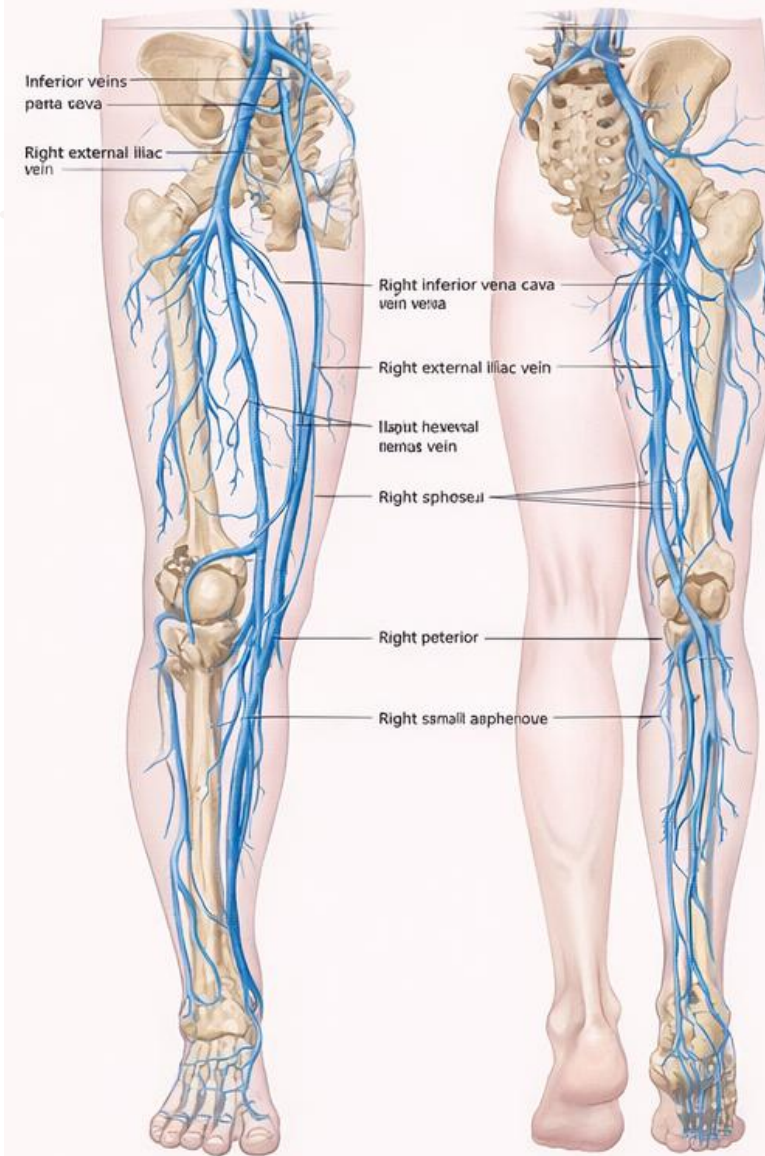
Secondary Varicose Veins

- Occur secondary to other causes
- Caused by:
 - Tumor compression
 - Inflammation of veins (phlebitis)
 - Damage to venous valves
- Involve deep veins

Varicose vein



Varicose Vein Locations



(1) Inferior view

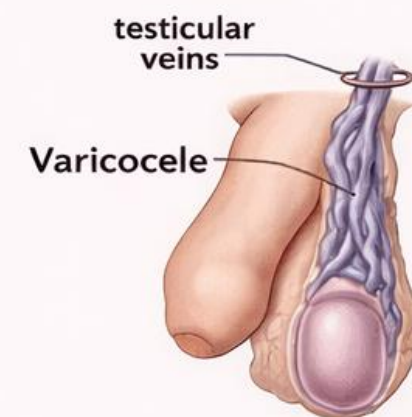
(2) Posterior view

Superficial Veins

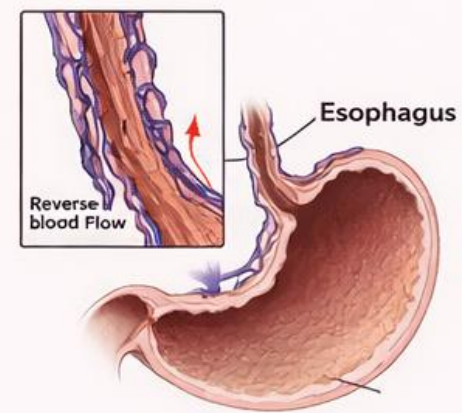
- Long saphenous vein
- Short saphenous vein

Deep Vein

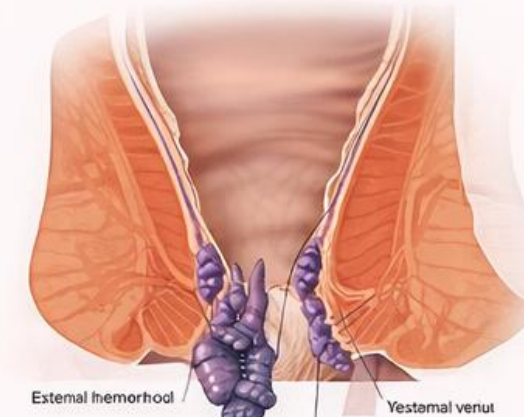
- Common iliac vein



Varicocele



Esophageal varice



Hemorrhoid



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