General Pathology

Hemodynamic Disorders, Thromboembolic Disease and Shock

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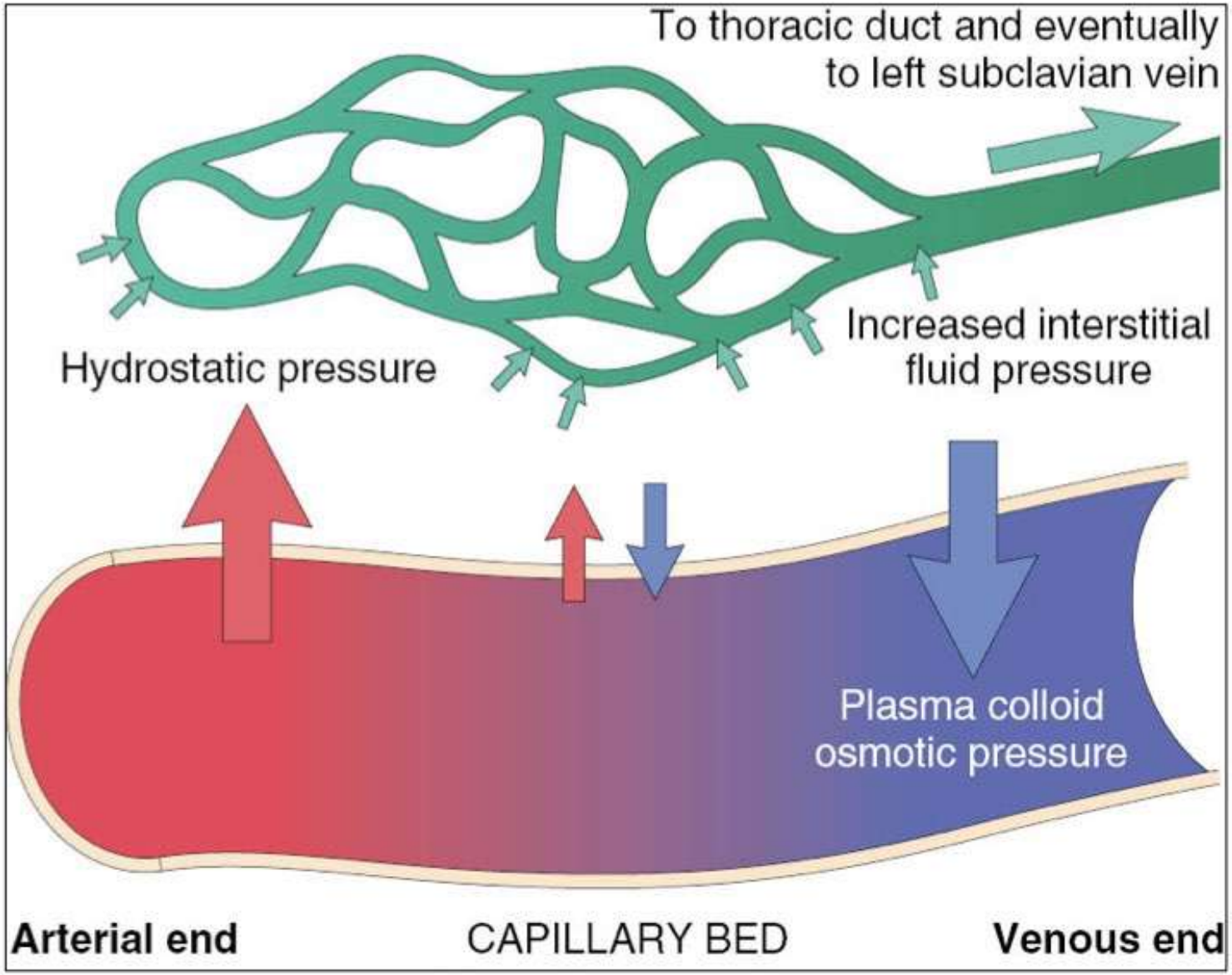
Hemodynamic disorders refer to abnormalities in the blood flow and fluid balance within the circulatory system.



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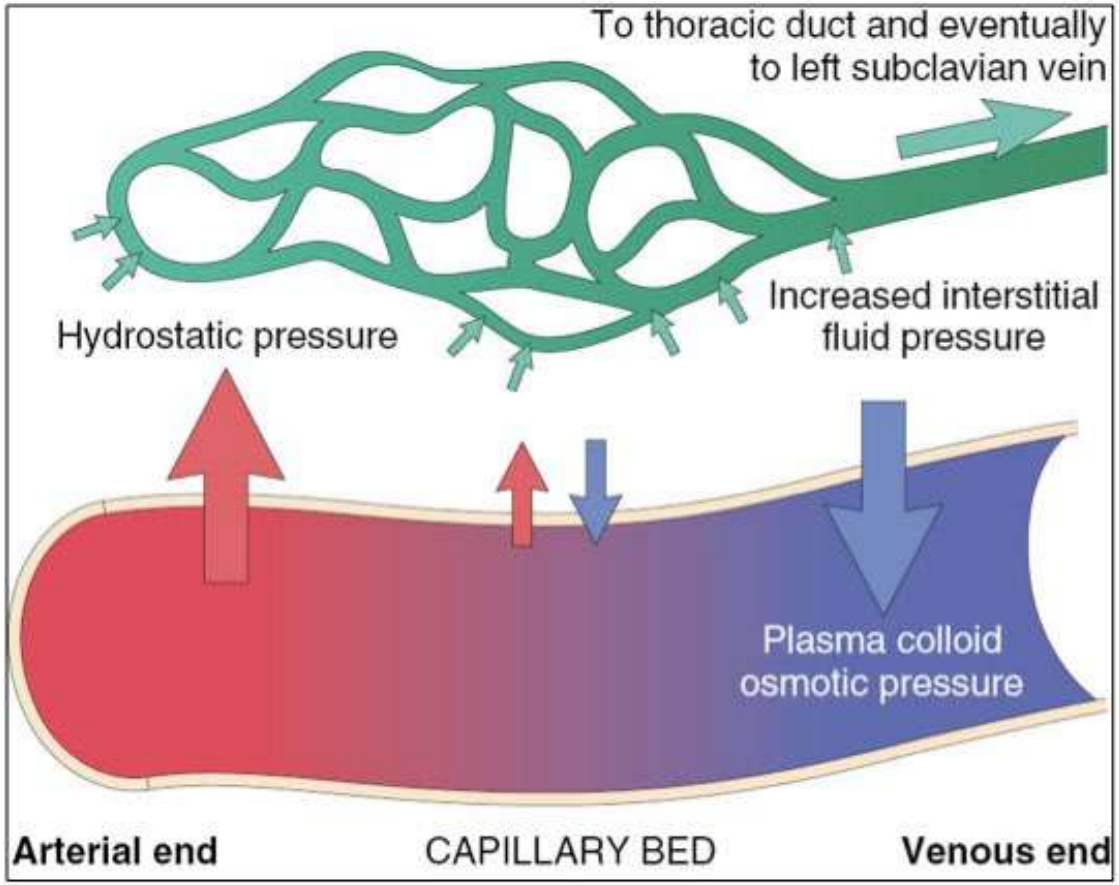
- **Edema**: Excess fluid in tissues. Can be due to:
  - Increased hydrostatic pressure (e.g., heart failure)
  - Decreased plasma oncotic pressure (e.g., liver disease, nephrotic syndrome)
  - Lymphatic obstruction
  - Inflammation



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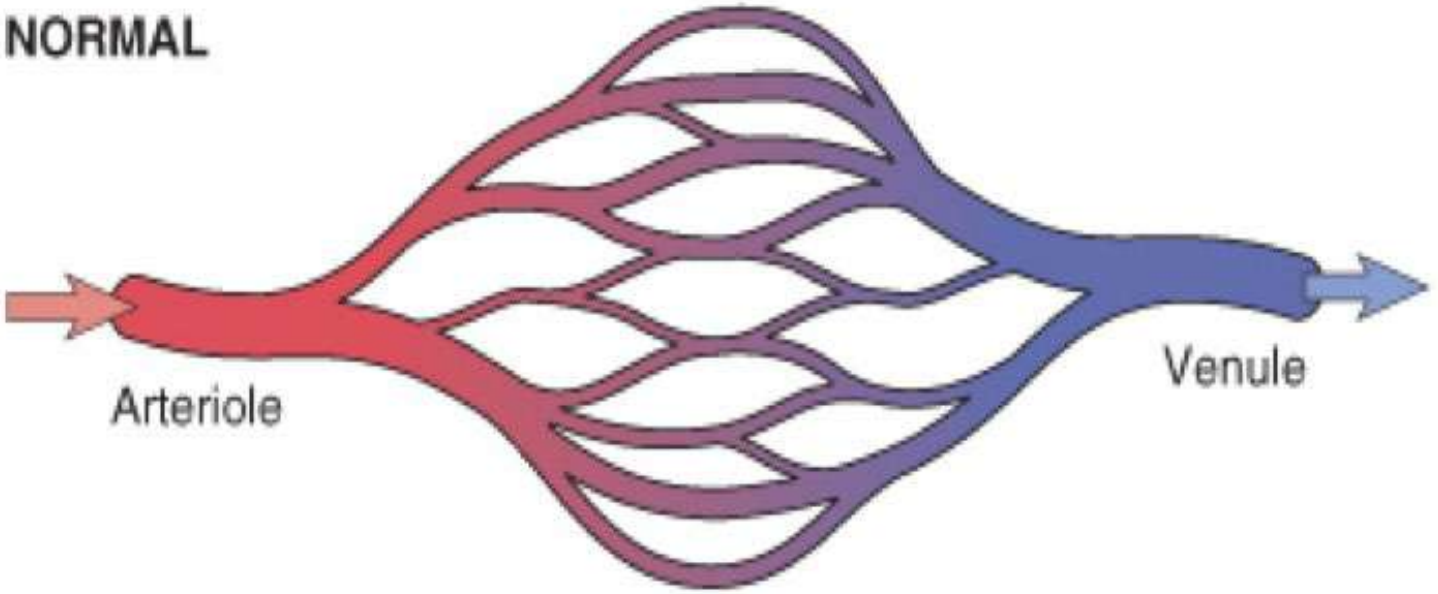
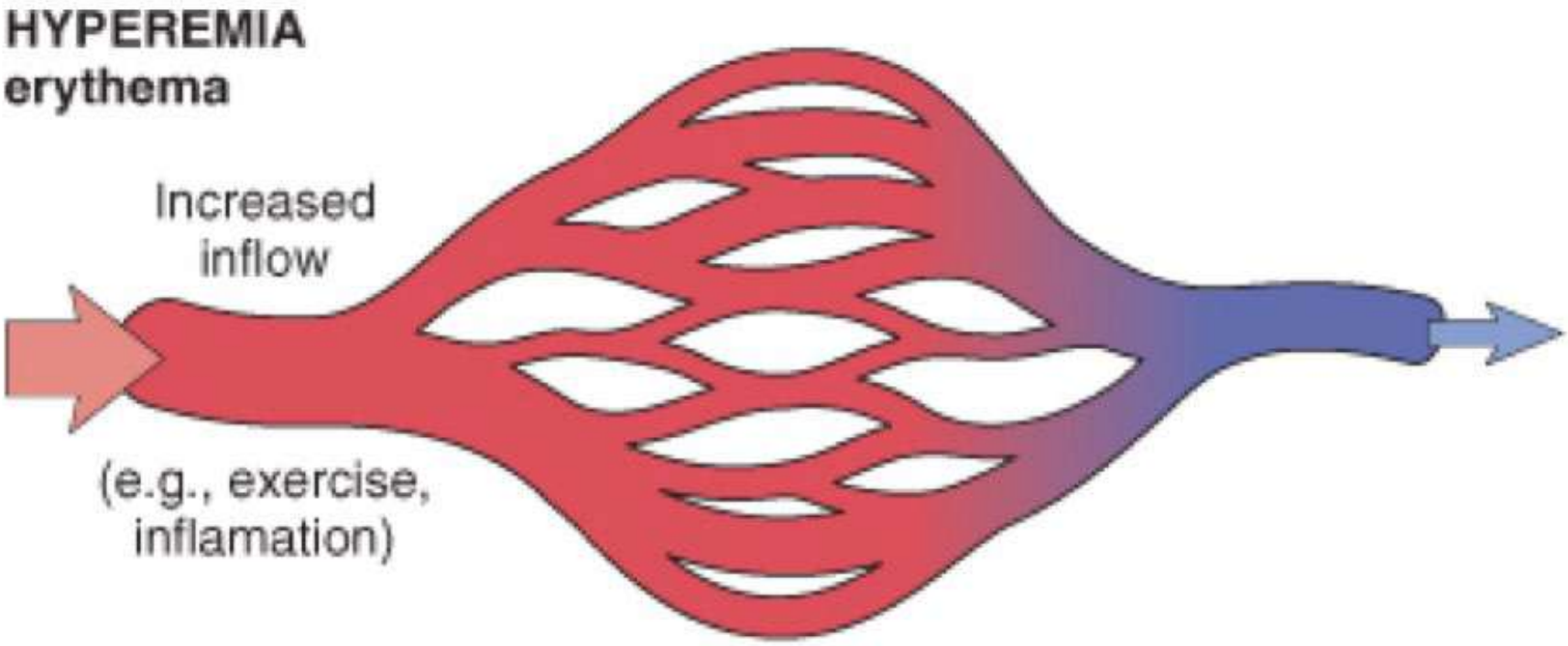
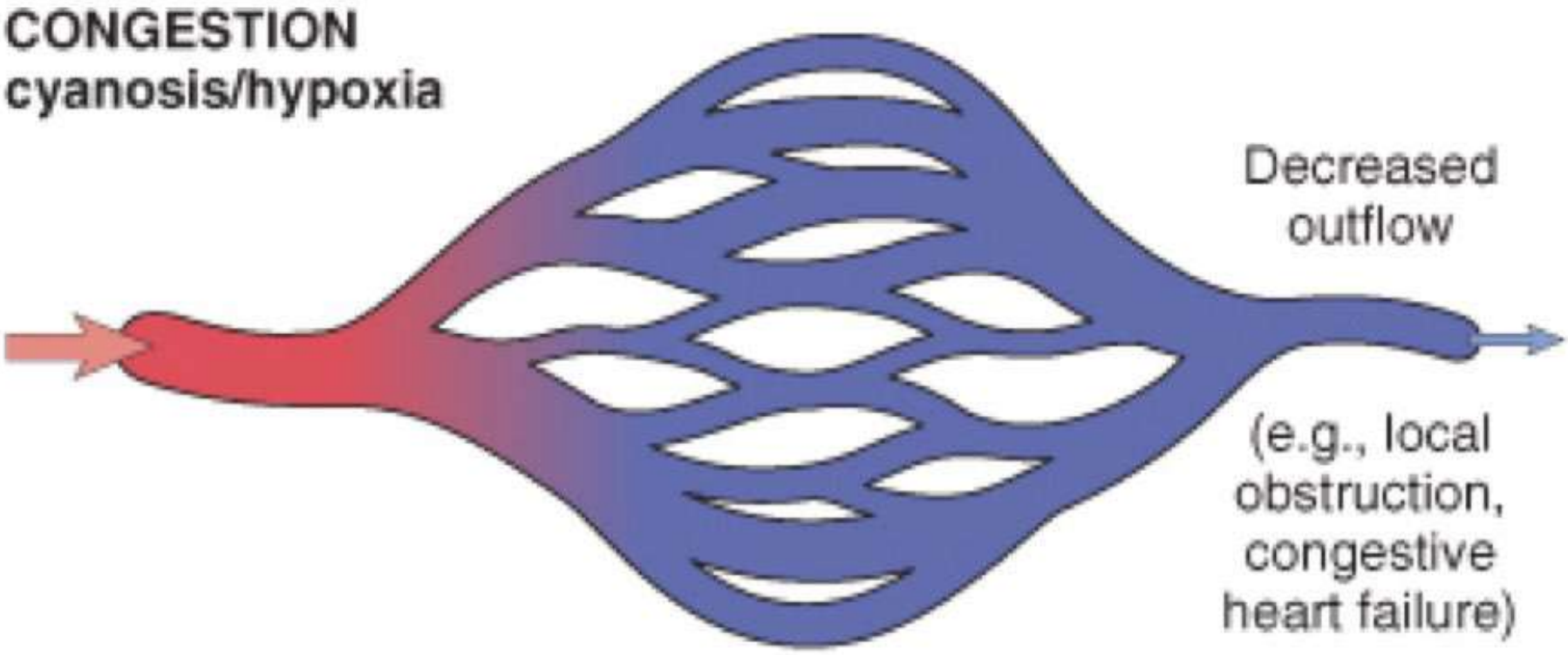
Hyperemia vs. Congestion



Hyperemia: Active process due to arteriolar dilation (e.g., during exercise or inflammation).

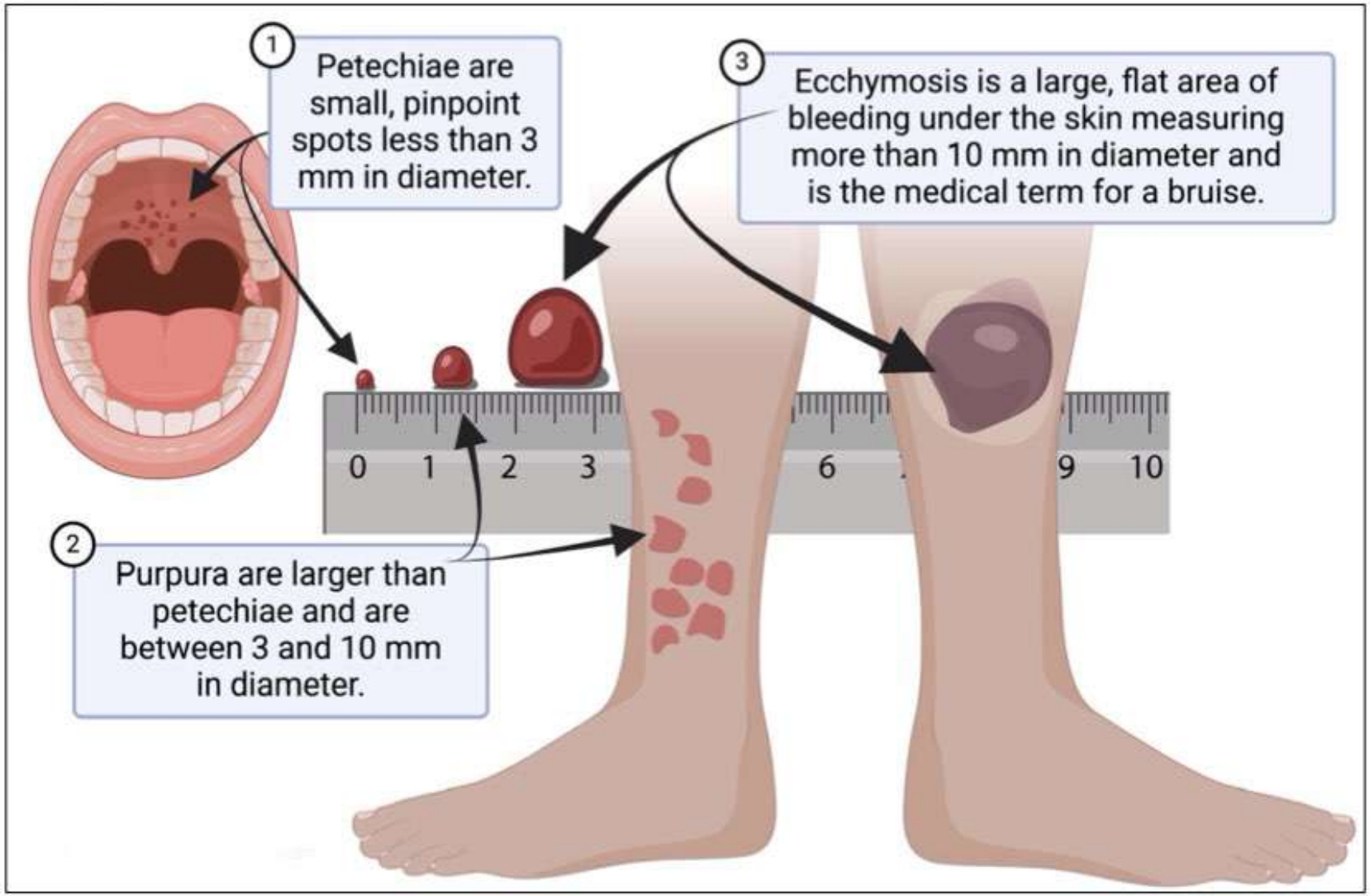


Congestion: Passive process due to impaired venous outflow (e.g., chronic lung congestion in left heart failure).



Hemorrhage: Extravasation of blood due to vessel rupture.

Types: petechiae, purpura, ecchymosis, hematoma.



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- **Hemostasis**: A tightly regulated process to stop bleeding.
  - Involves platelets, clotting factors, endothelium.
  - Pathologic form = **thrombosis**

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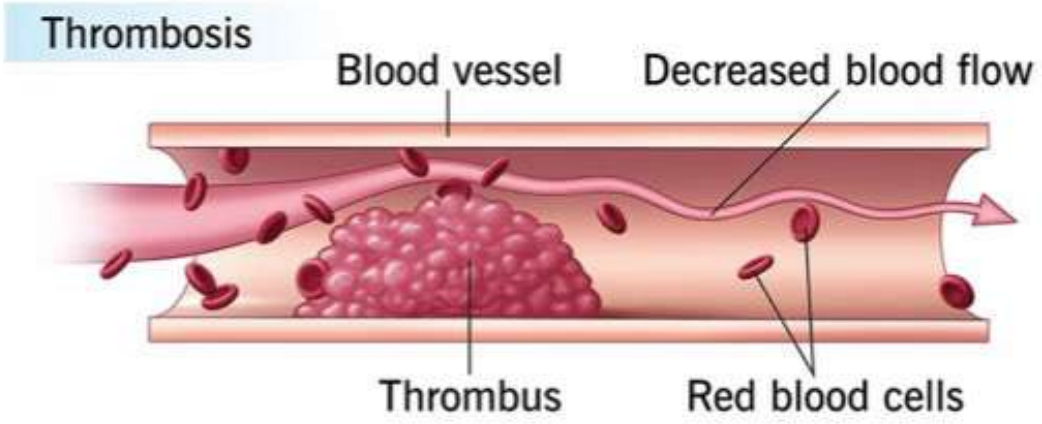
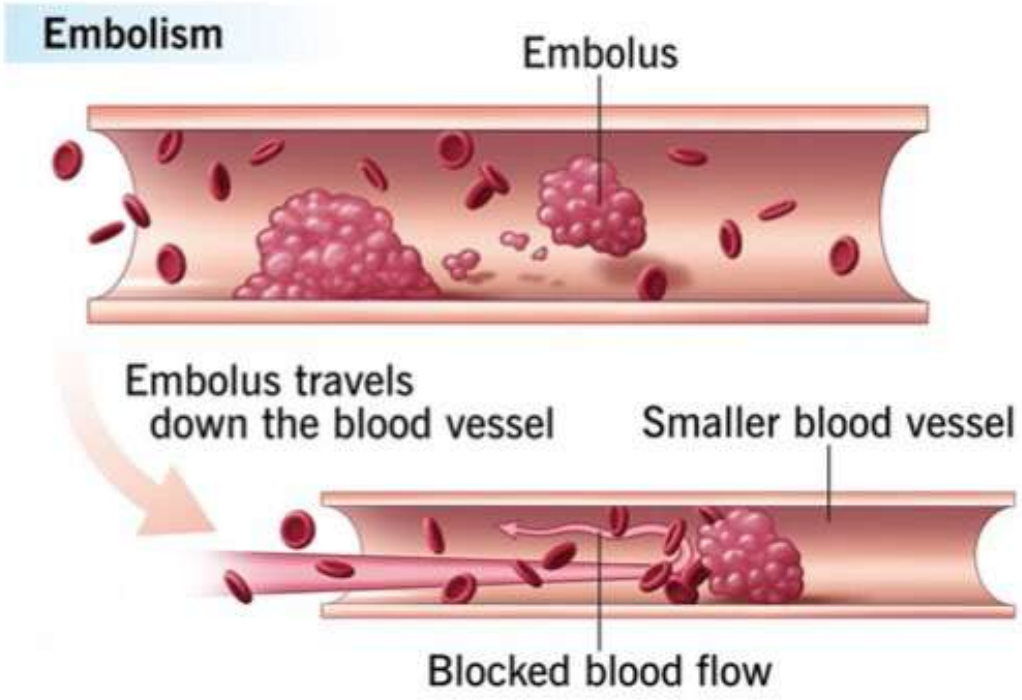
Thromboembolic Disease

Definition: This includes diseases caused by abnormal clot formation (**thrombosis**) and clot migration (**embolism**).





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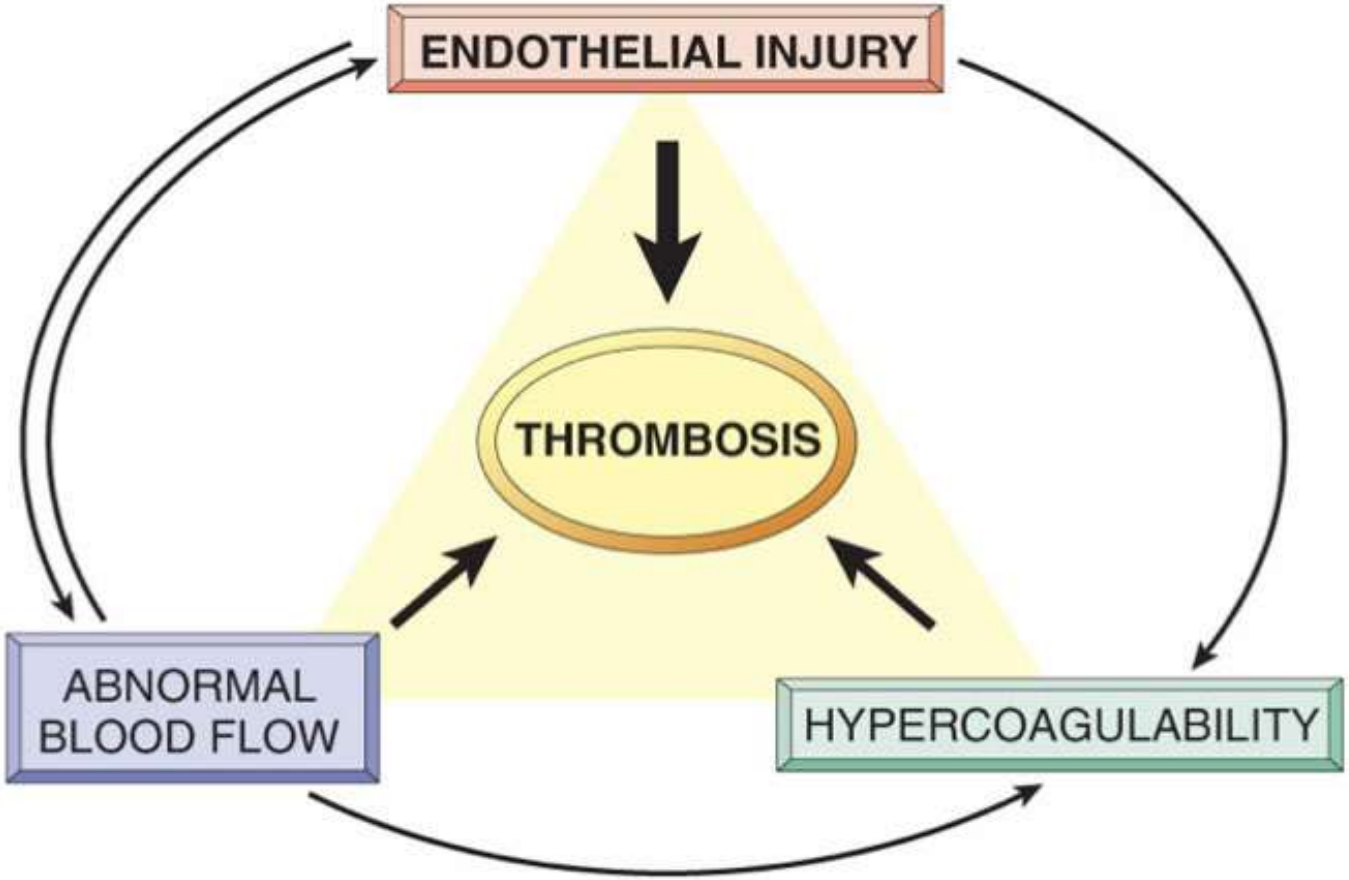
Virchow's Triad – the three primary causes of thrombosis:

1. **Endothelial injury** (e.g., trauma, atherosclerosis)
2. **Stasis or turbulence of blood flow** (e.g., immobility, atrial fibrillation)
3. **Hypercoagulability** (e.g., genetic disorders, malignancy, pregnancy)



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Types of Thrombi:

- **Arterial thrombi**: Often rich in platelets; can cause infarction.
- **Venous thrombi**: Usually in deep veins of legs (DVT); can lead to **pulmonary embolism (PE)**.

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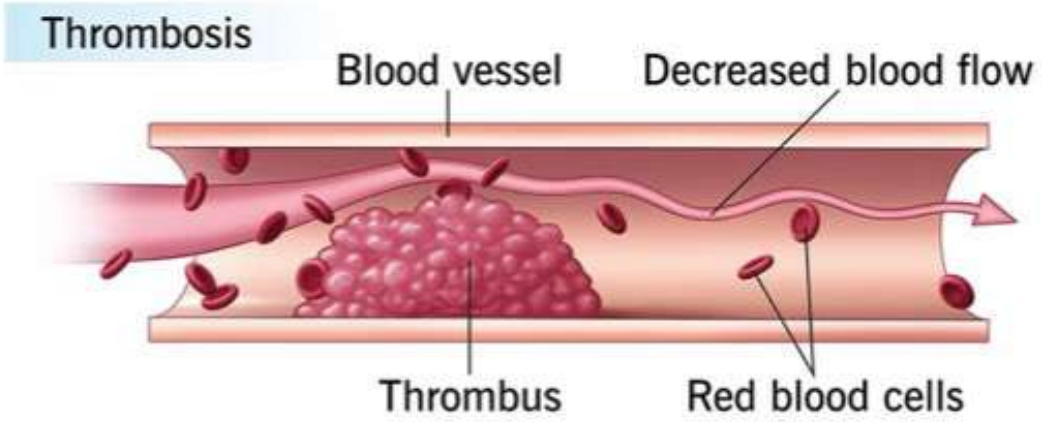
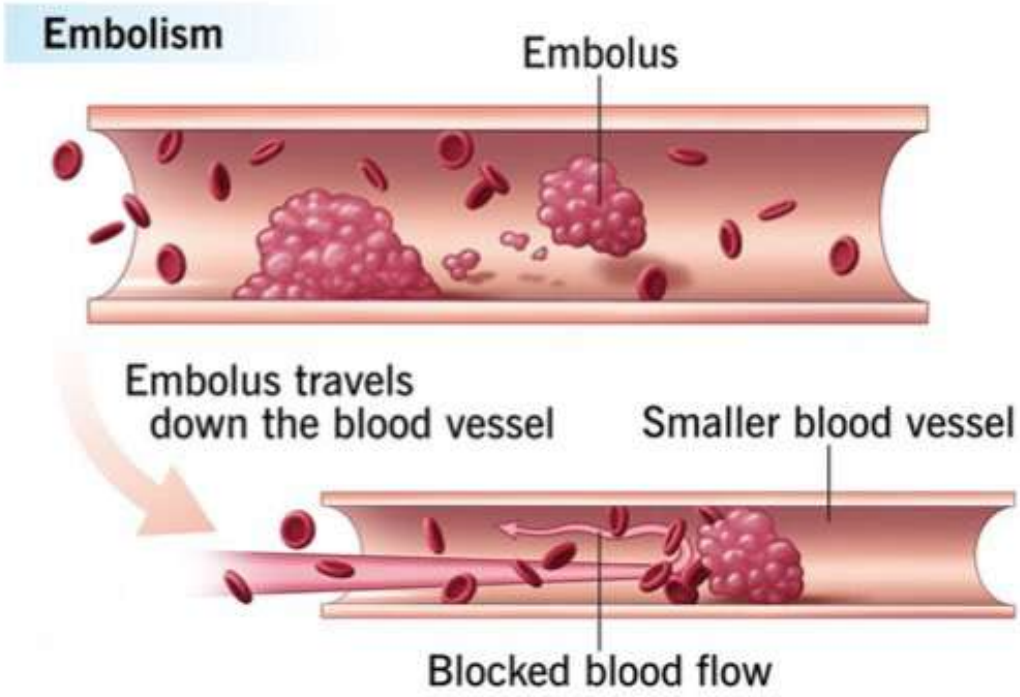
Embolism: Intravascular solid, liquid, or gas mass carried by the blood to a distant site.

- **Types**: Thromboembolism (most common), fat embolism, air embolism, amniotic fluid embolism.





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Clinical Importance:

- **Pulmonary embolism**: Can be fatal.
- **Systemic embolism**: Can cause stroke, infarcts in organs.

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Shock

Definition: A state of circulatory failure leading to inadequate perfusion of tissues and organs → cellular hypoxia.

Types of Shock:

1. **Hypovolemic** – due to blood or fluid loss (e.g., trauma, hemorrhage)
2. **Cardiogenic** – due to heart pump failure (e.g., myocardial infarction)
3. **Obstructive** – due to physical obstruction to circulation (e.g., PE, tamponade)
4. **Distributive** – due to severe vasodilation
    - Includes **septic shock**, **anaphylactic shock**, and **neurogenic shock**

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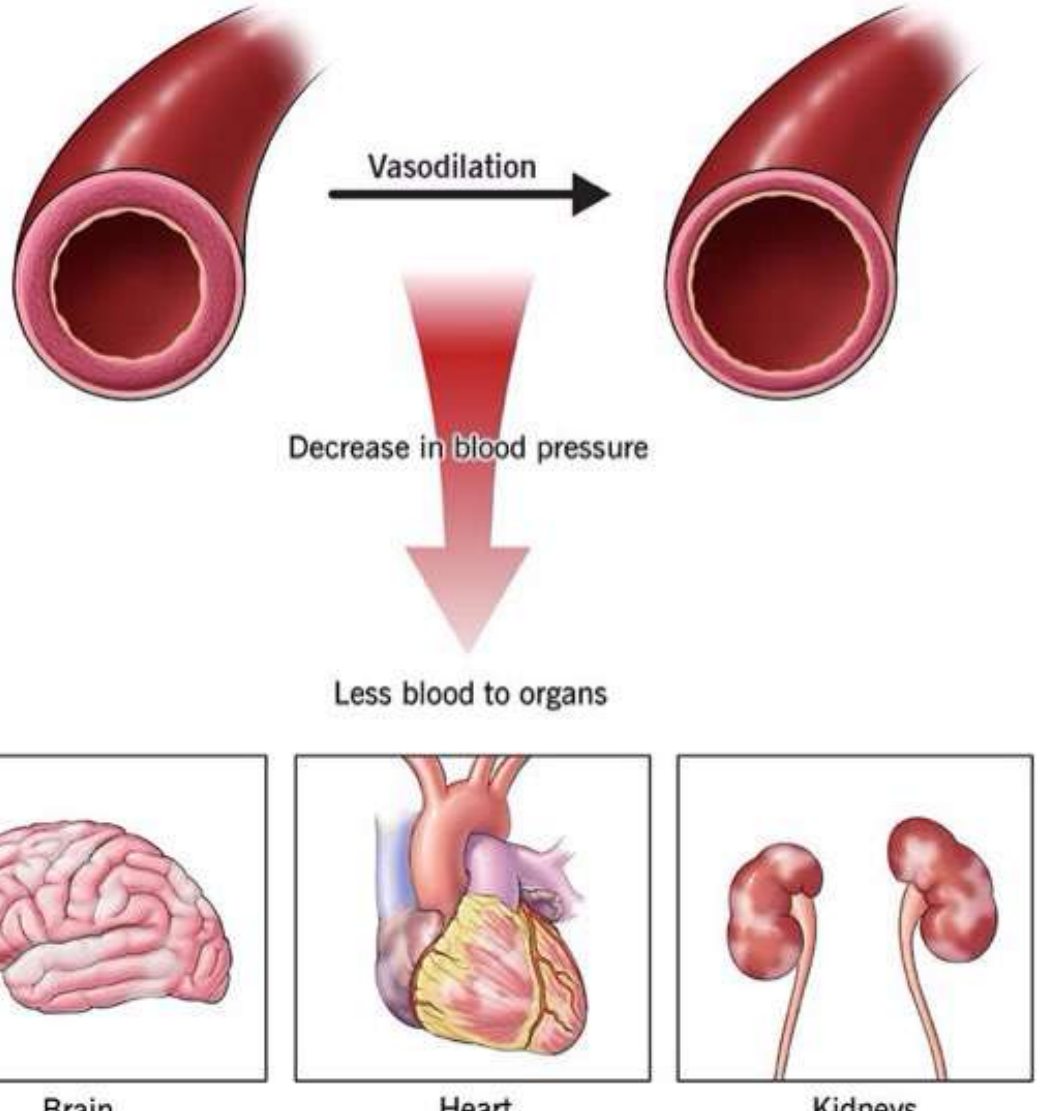
Septic Shock (a subtype of distributive shock):

- Caused by systemic infection → widespread inflammation → vasodilation + increased permeability.
- Most common form of death in ICUs.



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Stages of Shock:

1. **Initial (compensated)**: Reflex mechanisms maintain perfusion.
2. **Progressive**: Tissue hypoxia worsens, acidosis begins.
3. **Irreversible**: Multi-organ failure, often fatal.

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Summary

- **Hemodynamic disorders** include disturbances in fluid balance and blood flow.
- **Thromboembolic disease** centers around abnormal clot formation and embolization, leading to infarcts.
- **Shock** is a critical condition of circulatory collapse that must be rapidly identified and treated.

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