

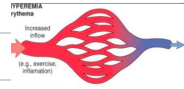
Hemodynamic Disorders, Thromboembolism, and Shock

Composition of blood: 1. plasma protein (Fluid and electrolyte). 2. RBC and WBC . 3. Clotting pathway.

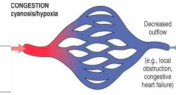
1. HYPEREMIA AND CONGESTION

increase in blood volume within a tissue.

Hyperemia is an active process resulting from arteriolar dilation and increased blood inflow, as occurs at sites of inflammation or in exercising skeletal muscle.



Congestion is a passive process resulting from impaired outflow of venous blood from a tissue. It can occur systemically, as in cardiac failure, or locally as a consequence of an isolated venous obstruction.



Clinically

Hyperemic tissues are redder + oxygenated blood

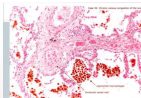
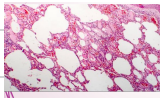


Congested tissues have an abnormal blue-red color (cyanosis) + deoxygenated hemoglobin



Congestion

Lung congestion

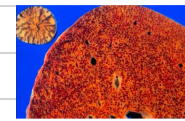


acute pulmonary congestion

blood-engorged alveolar capillaries and variable degrees of alveolar septal edema and intraalveolar hemorrhage.

chronic pulmonary congestion

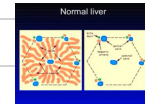
the septa become thickened and fibrotic, and the alveolar spaces contain numerous macrophages laden with hemosiderin ("heart failure cells") derived from phagocytosed red cells.



Hepatic congestion

creating "nutmeg liver"

Microscopic findings include :
centrilobular hepatocyte necrosis.
Hemorrhage.
hemosiderin-laden macrophages



2. EDEMA

Is an accumulation of interstitial fluid within tissues and subcutaneously.

Anasarca is severe, generalized edema marked by profound swelling of subcutaneous tissues and accumulation of fluid in body cavities.

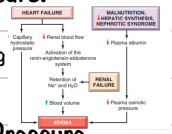


Table 4.1 Causes of Edema	
Increased Hydrostatic Pressure	
Impaired Venous Return	
Congestive heart failure	
Constrictive pericarditis	
Ascites (liver cirrhosis)	
Venous obstruction or compression	
Thrombosis	
External pressure (e.g., mass)	
Lower extremity inactivity with prolonged dependency	
Arteriolar Dilation	
Heat	
Neurohumoral dysregulation	
Reduced Plasma Osmotic Pressure (Hypoproteinemia)	
Protein-losing glomerulopathies (nephrotic syndrome)	
Liver cirrhosis (ascites)	
Malnutrition	
Protein-losing gastroenteropathy	
Lymphatic Obstruction	
Inflammatory	
Neoplastic	
Postsurgical	
Postirradiation	
Sodium Retention	
Excessive salt intake with renal insufficiency	
Increased tubular reabsorption of sodium	
Renal hypoperfusion	
Increased renin-angiotensin-aldosterone secretion	
Inflammation	
Acute inflammation	
Chronic inflammation	
Angiogenesis	

Mechanisms of edema

1. Increased Hydrostatic Pressure:

- Localized: e.g deep venous thrombosis.
- Generalized increases in venous pressure: e.g congestive heart failure.



2. Reduced Plasma Osmotic Pressure

- albumin accounts for almost half of the total plasma protein.
- common causes of reduced plasma osmotic pressure:
- lost from the circulation: e.g Nephrotic syndrome
- synthesis of inadequate amounts: e.g severe liver disease (e.g., cirrhosis) and protein malnutrition.



3. Lymphatic Obstruction

- peau d'orange (orange peel).
- filariasis can cause massive edema "elephantiasis"

4. Sodium and Water Retention

- by increasing hydrostatic pressure (because of expansion of the intravascular volume)

Subcutaneous edema

- in the legs with standing and the sacrum with recumbency, a relationship termed dependent edema.
- pitting edema.
- Under microscope: skin shows clearing and separation of the extracellular matrix
- Edema resulting from renal dysfunction or nephrotic syndrome often manifests first in loose connective tissues (e.g., the eyelids, causing periorbital edema).

Clinical Features

Subcutaneous edema :

- is important to recognize primarily because it signals potential underlying cardiac or renal disease.
- , it also can impair wound healing and the clearance of infections.

Pulmonary edema:

It can cause death

Brain edema:

- Is life threatening; if the swelling is severe, the brain can herniate (extrude) through the foramen magnum pressure, the brain stem vascular supply can be compressed, leading to death due to injury to the medullary centers controlling respiration and other vital functions .

HEMORRHAGE

extravasation of blood from vessels, is most often the result of damage to blood vessels or defective clot formation.

Subcutaneous Bleeding may present as

1. Petechiae: are minute (1 to 2 mm in diameter)

2. Purpura are slightly larger (3 to 5 mm) hemorrhages.

3. Ecchymoses: are larger (1 to 2 cm) subcutaneous hematomas (also called bruises).

The clinical significance of any particular hemorrhage depends on:

- ✓ the volume of blood that is lost. ✓ the rate of bleeding.