Objectives
Week 1 – Lecture 3
- To describe factors affecting blood pressure.
- Identify key components that contribute to Atherosclerosis.
- Describe the flow of fluids from the capillaries to the interstitial tissues.
- To outline the contributing factors associated with shock.
- Introduce the variations of fetal circulation.

Maintaining BP
Cardiac Output (CO) is = Blood Flow
CO = stroke volume x heart rate
Normal CO is 5.0-5.5 L/min

Heart rate is regulated by medulla, which sends messages to the heart via the vagus nerve.

Autoregulation
- Automatic adjustment of blood flow to each tissue in proportion to its requirements at any given point in time
- Is controlled intrinsically by modifying the diameter of local arterioles feeding the capillaries
- Is independent of MAP, which is controlled as needed to maintain constant pressure

Short-term regulation of BP
I. Neural controls
   A. Baroreceptors
      - carotid sinuses
      - aortic arch
      - major arteries & veins in neck
   B. Chemoreceptors
      Response to changing gas levels

II. Chemical Control:
Adrenal medulla – norepinephrine & epinephrine.
Atrial natriuretic peptide
ADH – water conservation
Inflammatory chemicals
Alcohol
Indirect Renal Mechanism (Long-term BP regulation)

A. Direct – alter BV by changing filter rate (high BV or BP)
B. Indirect – Renin-angiotensin mechanism (low MAP)

Renin (enzyme) > Angiotensin II > Aldosterone

Aldosterone (hormone) → Na+ reabsorption in kidneys & stimulates release ADH for H2O retention. Result → Increases BP & BV

Tissue Perfusion

The flow of blood through the body tissues. aka Vasomotion (for capillaries)

Importance:
1) Delivers oxygen and nutrients to tissue cells.
2) Gas exchange in lungs
3) Absorption of nutrients in GI
4) Urine formation in kidneys

Majority of blood at rest is in the abdominal organs – 24%
During exercise more blood flows to the skeletal muscles.

Movement of Fluids in the Capillaries

Substances move from the blood TO the interstitial fluids by diffusion.

Hydrostatic Pressure: Pressure on capillary walls by fluids.

Edema

Accumulation of fluids in body parts or tissues resulting in swelling.

Caused by
> Depressed blood protein concentration.
> Inactivity
> Capillary endothelial damage
> Increased Capillary permeability
> Increased Plasma fluid volume
> Elevated hydrostatic pressure
Physiology of Shock

What happens if the body suffers from severe blood loss or hemorrhage?

aka **Hypovolemic Shock**

*Fig 19.18*

- Peripheral vasoconstriction (cyanotic skin)
- Water retention by kidney i.e. less urine
- Increased respiratory rate
- BP may drop significantly
- Pulse weaken

Know different forms – see pg 738-740

Other Types of Shock

Vascular shock – blood accumulates in the extremeties.

- Neurogenic
- Syncope
- Septic Shock
- Anaphylactic Shock

Fetal Circulation

Know Unique modifications

**Umbilical cord** – 2 umbilical arteries and one umbilical vein.

**Ductus arteriosus** – A shunt that directs blood from pulmonary artery into the aorta, thus bypassing the lung.

**Foramen Ovale** – An opening connecting right and left atrium