Integrated System For Bodily Functions

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Integration of system

- Homeostasis needs integration of body systems
- This is monthly achieved by way of hormones
- The cardiovascular and renal systems have intimate relationship
- This relationship is important mostly to maintain blood pressure

Integration of cardiovascular and renal system

- Important hormones in this regulation
  - Angiotensin II
  - Aldosterone
  - ADH
  - Adrenaline
  - Noradrenaline

Integration of cardiovascular and renal system

- Revise formation of angiotensin II
- Angiotensin II
  - Power full vasoconstrictor
  - Stimulates secretion of aldosterone
  - Stimulate thirst
  - Stimulate ADH secretion

Regulation blood pressure in healthy person

- BP = CO x TPR
- Rising TPR immediately increases the blood pressure
- This is not going to sustain
- Kidney will respond by way of diuresis and natriuresis
- This results loss of water and salt
- Pressure returns to normal

ECF volume and BP

- Increase CSF volumes increases blood pressure
- Direct effect – by way of increasing CO
- Secondary effect – increased blood flow through tissue induces vasoconstriction by way of autoregulation

Hypertension

- Sustained increase in blood pressure
- Beyond the normal limits
- Hypertension results
  - Hypertrophy of the myocardium
  - Damage the major blood vessels
  - Renal damage leading to chronic renal failure

Renin-angiotensin system – its role in hypertension

- Result renal retention of salt and water
- Angiotensin II
  - Directly act on kidneys to causes salt and water retention
  - Stimulate aldosterone secretion

Renin-angiotensin system – its role in hypertension

Component of renin-angiotensin

Hypertension in renal artery stenosis

- In renal artery stenosis
  - Ischemic kidney releases renin
  - Increases angiotensin II
- In co-aractaion
  - Both kidneys are ischemic

- Why is dangerous to give ACEI in bilateral renal artery stenosis ?

Pressure control mechanisms

- Rapidly acting mechanisms

- almost entirely neural
- fast and powerful
  - baro receptor mechanism
  - chemo receptor mechanism
  - CNS ischemic mechanism

Results

- venoconstriction and shifting of blood
- positive chronotropic and inotropic action
- peripheral vasoconstriction

Pressure control mechanisms

- Mechanisms act after minute
  - Renin angiotensin
  - Capillary fluid shift

Pressure control mechanisms

- Long term
  - Renal mechanisms

Shock

- A syndrome inadequate tissue perfusion
- Types
  - Hypovolaemic
    - Haemorrhagic
    - Traumatic

Shock

- Features
  - Cool, clammy, skin
  - Cyanosis
  - Tachycardia
  - Pallor
  - Hypotension
  - Tachypnoea

Rapid compensatory mechanisms

- Rapid compensatory mechanisms
- Reduction of CO -> less baroreceptor stimulation -> stimulation of
- Sympathetic out put
  - Tachycardia
  - Vasoconstriction
    - Generalized except – brain and heart
    - Marked in skin – clod clammy hands
    - Also in viscera and kidneys

Rapid compensatory mechanisms

- Venoconstriction
  - Widespread reflex venoconstriction
  - Splenic, skin, and pulmonary veins
  - Shift blood from capacitance vessels to systemic circulation
- Renal vasoconstriction
  - Both afferent and efferent arterioles
  - More in efferent
  - Result reduction of GFR

Rapid compensatory mechanisms

- Increase angiotensin II
  - Vasoconstriction
  - Stimulation of aldosterone secretion
  - Stimulation of thirst – subfornical organ
  - Stimulation of ADH secretion
    - Vasoconstriction
    - Retention of water
- Stimulation of adrenal medullary secretions
  - Increased noradrenaline

Rapid compensatory mechanisms

- Chemoreceptor stimulation due to
  - Anemic and stagnant hypoxia
  - Acidosis
  - Results
    - Tachypnea

Long term compensatory mechanisms

- Mobilization of tissue fluids
  - Most are protein free
  - Rapid entry of albumin from stores
  - Increase in erythropoietin levels
  - Increase level of 2,3 DPG