Hypo & Hyperparathyroidism
Disorders of the parathyroid glands

- Hyperparathyroidism (hypercalcemia)
- Hypoparathyroidism (hypocalcemia)
Calcium Homeostasis

Low circulating serum calcium concentrations stimulate the parathyroid glands to secrete PTH, which mobilizes calcium from bones by osteoclastic stimulation. PTH also stimulates the kidneys to reabsorb calcium and to convert 25-hydroxyvitamin D3 (produced in the liver) to the active form, 1,25-dihydroxyvitamin D3, which stimulates GI calcium absorption. High serum calcium concentrations have a negative feedback effect on PTH secretion.
Ca Metabolism

* Importance of Ca in body:
  1- Bone mineralization.
  2- Blood coagulation.
  3- Neuromuscular transmission.
  4- Neurotransmitter release.
  5- Contraction of all muscle types.
  6- Cell membrane permeability and excitability.
  7- Secretion of glands.
Hyperparathyroidism

- Hyperparathyroidism is an excess of parathyroid hormone in the bloodstream due to over activity of one or more of the body's four parathyroid glands.
Hyperparathyroidism

Primary
- Parathyroid hyperplasia
- Parathyroid adenoma
- Parathyroid carcinoma

Secondary
- Parathyroid hyperplasia

Tertiary
- Autonomous nodule on top of hyperplasia
Pathophysiology

Action of parathormone hormone:

Increase serum calcium level by:
Ca re-absorption from renal tubules.
Ca absorption from the GIT.
Bone resorption

Decrease serum phosphate level by:
Increase serum excretion of phosphate.
Clinical manifestation

- Depression, fatigue, loss of appetite, constipation, osteoporosis, fractures, kidney stones
- Diagnostic test: bone x-rays, Ca & PTH levels
- Management: Decrease high serum levels, surgical removal of parathyroid
Medical management

- Phosphorus supplementation
- Biphosphates (Fosamax) – inhibit bone resorption of Ca to normalize Ca serum levels
- Oral phosphate – inhibit Vit D effects
- Calcimimetic agent: increase sensitivity of calcium receptor on parathyroid gland thus decreased PTH secretion and serum Ca levels
Hypoparathyroidism

- Results from abnormally low levels of PTH → low Ca level
- Symptoms: painful spasms of face, hands, arms, and feet; seizures
- TX: IV Calcium; Cal, Mag & vit D;
Primary hypoparathyroidism

Is this the main cause of hypocalcemia?

↓PTH

Blood
↓Ca²⁺: PO₄³⁻ ratio

Kidney

↓PO₄³⁻ excretion

↑Ca²⁺ excretion

Bone

↓Resorption

Intestine

↓Ca²⁺ and PO₄³⁻ absorption

↓Vitamin D activation
Signs that indicate abnormal calcium level

- **Trousseau’s sign:** temporarily occlude arterial blood flow (with BP cuff inflated) above the normal systolic pressure.
  - Trousseau’s sign occurs when the hand and fingers contract from ischemia

- **Chvostek’s sign:** tap on the facial nerve just below the temple.
  - Sign is + when nose, eye, lip & facial muscles twitch
**Hyperparathyroidism**

- **Etiology**
  - Overproduction of the cells secreting PTH
  - Parathyroid develops a tumor

- **Pathogenesis**
  - Bone Pain
  - Depression
  - Frequent urination
  - Kidney stones
  - Nausea
  - Loss of appetite

- **Treatment**
  - Remove the tumor surgically
Hypoparathyroidism

- Etiology
  - Family History
  - Autoimmune Disorder
  - Excessive radiation treatment
  - Low levels of Mg in blood

- Treatment
  - restore the Ca and mineral balance in the body
  - Take vitamins with Calcium and Vitamin D

- Pathogenesis
  - Heavier periods in females
  - Cataracts
  - Tingling sensations
  - Muscles spasms
  - Dry hair and skin; brittle nails
  - Weakened tooth enamel in kids