Hypocalcemia

Etiology

Other Causes

Neonatal

- **Maternal Factors:** Mother w/ diabetes, Vit D deficiency, AED use, hyperparathyroidism, or eclampsia
- **Neonatal Factors:** low birth weight, prematurity, IUR, asphyxia
- Other Illness: sepsis, RDS, hyperbilirubinemia, renal failure

Miscellaneous

- **Hungry Bone Syndrome:** Avid bone mineralization after recovery from severe mineralization defect (e.g., vitamin D deficiency)
- **Osteopetrosis:** oss of osteoclast function
- Citrate or Lactate administration (e.g., from blood transfusion)
- **Pancreatitis:** complex formation w/ fatty acids
- **Drugs:** bisphosphonates, foscarnet, chemotherapy

Clinical Manifestations

Acute hypocalcemia
- Tremor, muscle spasms, paraesthesias, tetany (Chvostek, Trousseau signs)
- Seizures
- QT prolongation, impaired contractility
- Psychiatric symptoms (anxiety, agitation, hallucinations)

Vitamin D deficiency: rickets, muscle weakness, hypotonia, growth retardation
- Xrays show osteopenia, widening of the metaphysis, cupping/splaying of growth plate, formation of cortical spurs, fractures

Diagnostic Studies

- Albumin and/or ionized calcium to determine if true hypocalcemia
- If hypocalcemia confirmed send PTH, magnesium, phosphate, BUN, creatinine, 25OH-vitamin D

Treatment

- Calcium salts PO for chronic hypocalcemia
- Calcium salts IV for acute hypocalcemia
  - Ca gluconate 100 mg/kg (= 1mL/kg of 10% solution)
  - CaCl 20 mg/kg (= 0.2 mL/kg of 10% solution) for emergencies only (irritant, causes necrosis if extravasates)
- Replenish magnesium stores or give vitamin D as appropriate
  - If initiating treatment for vitamin D deficiency, always give calcium along vitamin D to prevent hypocalcemia from hungry bone syndrome
- In hypoparathyroidism, give 1,25 vitamin D (calcitriol) rather than ergocalciferol/cholecalciferol because of decreased 1a-hydroxylation in the kidney
- If hyperphosphatemic, avoid [Ca+] X [PO4] >55 because of risk of metastatic calcification

Hypercalcemia

Definition

Normal values are age specific and vary between labs

Etiology

Parathyroid Related

- Primary hyperparathyroidism (adenoma or hyperplasia)
- Tertiary hyperparathyroidism (only occurs in chronic renal failure)
- Familial hypocalciuric hypercalcemia (loss of function CaSR)

Hypercalcemia

Etiology

Increased Bone Reabsorption

- Malignancy (metastatic or PTHrP secretion)
- Hypervitaminosis D
- Hypervitaminosis A
- Immobilization

Increased 1,25 OHD Production

- Granulomatous disease (sarcoid, tuberculosis)
- Subcutaneous fat necrosis in neonates

Metabolic Disorders

- Hypophosphatasia (defective alk phos)
- Blue diaper syndrome (defect in tryptophan metabolism)
- Congenital lactase deficiency

Renal Causes

Thiazide diuretics

Other

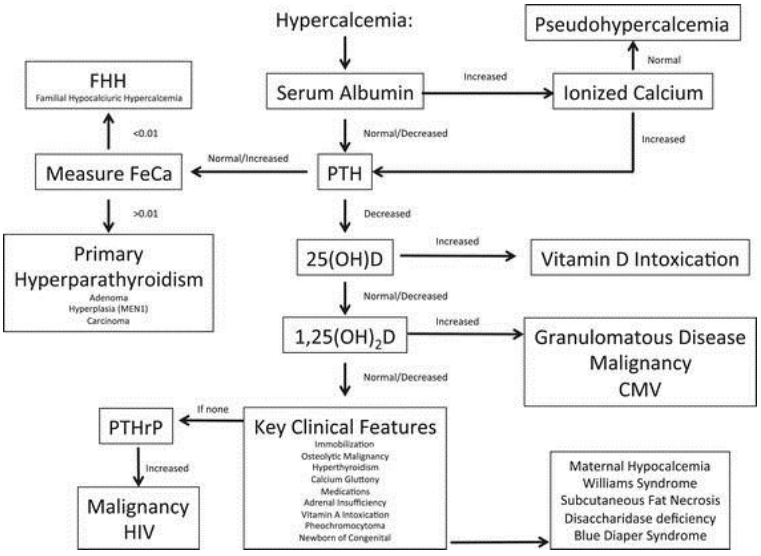
Adrenal insufficiency, Williams syndrome, thyrotoxicosis, milk alkali syndrome, excess calcium intake, ECMO (mechanism not well understood but thought to be secondary to incr PTH)

Clinical Manifestations

"Stones, bones, moans, psychiatric overtones"

- **Renal symptoms**: polyuria, renal stones, nephrocalcinosis
- **Musculoskeletal system**: Bone pain, joint aches
- **GI system**: paralytic ileus, abdominal cramping, constipation, anorexia, vomiting
- **Nervous system**: headache, personality change, proximal muscle weakness
- In infants, failure to thrive
- W/ severe hypercalcemia (>14 mg/dL) can have lethargy and coma

Diagnostic Algorithm



*subcutaneous fat necrosis often (not always) has incr 1,25 OHD

Hypercalcemia continued on next page →

Hypercalcemia	
Treatment	For severe hypercalcemia (>14 mg/dL) and/or symptomatic: • Increase calcium excretion: IV hydration w/ NS is first line; after hydration, may add, furosemide, • Decrease bone resorption: calcitonin: inhibits osteoclast bone resorption, promotes Ca and phos excretion. ▪ Calcitonin: inhibits osteoclast bone resorption, promotes Ca and phos excretion. • Initial dose IM/subq 2-4 units/kg every 12 hours, may increase to 8 units/kg every 12 hours to a max of every 6 hours. Most patients develop tachyphylaxis w/i 48 hours ▪ Bisphosphonates: inhibit osteoclast activity. Watch for hypocalcemia; also for hypophos and hypomag. • Pamidronate dose 0.5-1 mg/kg in children • Primary hyperparathyroidism - parathryoidectomy

Not in Handbook – See EBGs

1. Premature adrenarche
2. Vitamin D
3. Short stature