Understanding Hypocalcemia

What is Calcium?

NORMAL RANGE

9 to 10.5 mg/dL

MAIN FUNCTIONS

Regulated by 3 Hormones

- Parathyroid Hormone
  - Increase in Parathyroid hormone will increase calcium levels and decrease phosphorous levels (inverse relationship)

- Calcitonin Hormone
  - Put calcium into the Bones

- Calciotriol
  - Controls blood calcium by stopping the release of calcitonin

What is Hypocalcemia?

LOW CALCIUM RANGE

Less than 9 mg/dL

CAUSES

- Inhibition of calcium absorption from the gastrointestinal tract
- Inadequate oral intake of calcium
- Lactose Intolerance
- Malabsorption syndromes such as celiac sprue or Crohn’s disease
- Alcohol Abuse
- Liver Disease
- Inadequate intake of Vitamin D or Low Magnesium Levels
  - Required for absorption of calcium in the gut
- End Stage Kidney Disease
- Increased Calcium Excretion
  - Kidney Disease, polyureic phase
- Massive Diarrhea
  - Steatorrhea
  - Wound Drainage, especially GI
  - Calcium is normally absorbed in the GI system

Conditions that decrease the ionized fraction of calcium

- Hyperproteinemia
  - Increase in protein intake increases urinary excretion of calcium
- Alkalosis
  - Medications such as calcium chelators or binders
- Acute pancreatitis
  - Release of calcium soaps in the abdominal cavity and stimulates calcitonin hormone to put calcium into the bones

- Hyperphosphatemia
- Inverse relationship with calcium
- Hypoparathyroidism
- Decrease in parathyroid hormone will cause decreased calcium release
- Immobile
- Removal or destruction of the parathyroid glands

CAUSES

- Medications that cause Low Calcium
  - Medications such as laxatives and loop diuretics
- Corticosteroids
  - Can suppress PTH and calcium release in the blood
- Anti-Seizure Medications
  - Phenobarbital
  - Dilantin
  - Increase excretion by the kidneys
- Binds to calcium and magnesium
Understanding Hypocalcemia

**Hypocalcemia Interventions**

- **Replace Calcium (IV or PO)**
  - When administering calcium IV, warm the injection solution to body temperature (helps with discomfort) before administration and administer slowly.
  - Monitor for electrocardiogram changes, infiltration, and hypercalcemia.
  - Provide Vitamin D if giving calcium PO.

- **Medications Increase Calcium Absorption**
  - Aluminum hydroxide (Tums) reduces phosphorous levels causing the counter effect of increasing calcium levels.
  - Vitamin D aids in the absorption of calcium from the intestinal tract.

- **Quiet Environment to reduce environmental mental stimuli**

- **Instruct Patient to take Calcium-rich foods**
  - Dairy: Cheese, Milk, Yogurt
  - Collard greens and broccoli
  - Tofu and Sardines

**Gastrointestinal System**
- Hyperactive
- Increased gastric motility; hyperactive bowel sounds
- Cramping and diarrhea

**Respiratory System**
- Not directly affected but respiratory failure or arrest can occur due to decreased respiratory movement because of muscle tetany or seizures.

**Neuromuscular System**
- Irritable skeletal muscles: Twitches, cramps, tetany, seizures
- Painful muscle spasms in the calf or foot during periods of inactivity
- Paresthesia's followed by numbness that may affect the lips, nose, and ears
- Positive Trousseau and Chvostek's Signs
- Hyperactive deep tendon reflexes
- Anxiety and irritability
- Osteoporosis

**Laboratory Findings**
- Serum calcium levels less than 9 mg/dL
- Electrocardiogram changes:
  - Prolonged ST interval
  - Prolonged QT interval

**Respiratory System**
- Increased respiratory movement because of muscle tetany or seizures

- Risk for bleeding and dysrhythmias (Ventricular Tach)

**Cardiovascular System**
- Inefficient contractility with muscles
- Decreased heart rate
- Hypotension
- Diminished peripheral pulses

**Gastrointestinal System**
- increased gastric motility; hyperactive bowel sounds
- cramping and diarrhea

**Gastrointestinal System**
- Urinary output will vary depending on the cause

- Hyperactive deep tendon reflexes
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