**Calcium** is a highly regulated, ubiquitous cation that has multiple roles in the body. Changes in intracellular calcium concentration affect a myriad of cell functions, including cell death or apoptosis, the duration and strength of cardiac muscle contraction, and smooth muscle contraction in blood vessels, arteries, and the uterine muscle. Calcium exists in the extracellular plasma in a free ionized state as well as bound to other molecules.

- **Primary hyperparathyroidism** results from stimuli outside the normal feedback loop. Patients with elevated calcium concentrations should be screened for other conditions. In addition, severe hypercalcemia can cause the Osborn, or J wave, seen at the tail end of the QRS complex, which usually is associated with hypothermia.

**General**

- Calcium is a highly regulated, ubiquitous cation that has multiple roles in the body.

**Hyperparathyroidism**

- Primary hyperparathyroidism: The most common cause of primary hyperparathyroidism is a parathyroid adenoma (85%).
- Parathyroid hyperplasia: affects all glands and is the underlying cause of primary hyperparathyroidism.

**Secondary hyperparathyroidism** results from stimuli outside the normal feedback loop. This leads to increased bone resorption and decreased renal calcium reabsorption. Patients who fail medical therapy and acquire tertiary hyperparathyroidism develop clinical hypercalcemia. Patients with elevated calcium concentrations have electrocardiographic changes marked by shortened QTc intervals. In addition, severe hypercalcemia can cause the Osborn, or J wave, seen at the tail end of the QRS complex, which usually is associated with hypothermia.

**Diagnosis**

- Patients with elevated calcium concentrations should be screened for other conditions. In addition, severe hypercalcemia can cause the Osborn, or J wave, seen at the tail end of the QRS complex, which usually is associated with hypothermia.

**Fluids and diuretics**

- In the setting of hypercalcemia, initial management is medical and promotes the renal excretion of calcium. Patients with elevated calcium concentrations have electrocardiographic changes marked by shortened QTc intervals. In addition, severe hypercalcemia can cause the Osborn, or J wave, seen at the tail end of the QRS complex, which usually is associated with hypothermia.

**Steroids**

- Steroids lower calcium by inhibiting the effects of vitamin D. They also have been shown to inhibit intestinal absorption of calcium, increase renal calcium excretion, and inhibit osteoclast-activating factor. Steroids are particularly effective in the setting of hypercalcemia secondary to granulomatous diseases, where hypercalcemia stems from vitamin D toxicity. The initial dose of hydrocortisone is 200-400 mg intravenously per day for 3-5 days.

**Bisphosphonates**

- Bisphosphonates are pyrophosphate analogues that have a high affinity for hydroxyapatite in bone. They inhibit osteoclast activity for up to 6 months. In the hypercalcemia of malignancy, pamidronate (90 mg intravenously) or zoledronic acid (4 mg intravenously) is used to lower serum calcium concentrations in cancer patients.

**Pharmacologic agents** associated with hypercalcemia should be discontinued; specifically, bisphosphonates and calcitonin.

**Prevention**

- Early symptoms of hypocalcemia include paresthesias, muscle cramps, and mild mental status changes such as irritability. As hypocalcemia becomes more severe, there can be neuromuscular and cardiac findings, including Chvostek’s and Trousseau’s signs, as well as mental status changes, seizures, lethargy, hypotension, and acute heart failure.

**Investigation of hypocalcemia**

- Calcium is a highly regulated, ubiquitous cation that has multiple roles in the body. Changes in intracellular calcium concentration affect a myriad of cell functions, including cell death or apoptosis, the duration and strength of cardiac muscle contraction, and smooth muscle contraction in blood vessels, arteries, and the uterine muscle. Calcium exists in the extracellular plasma in a free ionized state as well as bound to other molecules.