HYPOCALCEMIA

DEFINITION:

- Total serum calcium level < 8.5 mg/dL.
- Ionized serum calcium level < 1.0 mmol/L.

INCIDENCE IN CRITICAL ILLNESS:

- 70-90% when total serum calcium is measured.
- 15-50% when ionized serum calcium is measured.
- The difference reflects the prevalence of hypoalbuminemia in the critically ill patient population.

ETIOLOGY:

- Usually multifactorial in critical illness.
- Impaired PTH secretion or action: Primary and secondary hypoparathyroidism.
- Vitamin D deficiency or resistance: Decreased intake; malnutrition; hepatic disease; renal disease; hypomagnesemia; sepsis; SIRS.
- Calcium chelation or precipitation: Hyperphosphatemia; citrate administration (massive blood transfusion); pancreatitis (saponification of retroperitoneal fat); rhabdomyolysis; ethylene glycol ingestion; alkalosis (causes increased binding of calcium to albumin).
- Impaired mobilization of calcium from bone: Hypothyroidism; calcitonin excess; administration of cisplatin, diphosphonate, mithramycin and phosphate.

CLINICAL MANIFESTATIONS:

- Frequently asymptomatic.
- Cardiovascular: Decreased cardiac output; hypotension refractory to vasopressors and plasma volume expansion; cardiac dysrhythmias (ventricular tachycardia, prolonged QT interval, complete heart block).
- Neuromuscular: Paresthesias; seizures; muscle spasms; tetany.
  - Chvostek's sign: Involuntary twitching of the facial muscles when the facial nerve is tapped. Present in 10-25% of normal adults; may be absent in chronic hypocalcemia.
  - Trousseau's sign: Carpopedal spasm in response to decreased blood flow to the hand (BP cuff inflated to 20 mm Hg for 3 minutes). Absent in 1/3 of hypocalcemic patients.
- Psychiatric: Dementia; psychosis; depression.

TREATMENT:

- Indicated in severe ionized hypocalcemia (< 0.8 mmol/L) and in symptomatic hypocalcemia.
- Intravenous repletion: Calcium chloride (calcium is physiologically immediately available); calcium gluconate (requires hepatic deglucuronation).
- NOTE: Direct measurement of ionized serum calcium concentration is more accurate than correcting total serum calcium for albumin and pH.

KEY REFERENCES: