

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 degluconation).
- NOTE: Direct measurement of ionized serum calcium concentration is more accurate than correcting total serum calcium for albumin and pH.

KEY REFERENCES:

- Zivin JR, Gooley T, Zager RA, et al. Hypocalcemia: A pervasive metabolic abnormality in the critically ill. *Am J Kidney Dis* 2001;37:689-698.
- Zaloga GP. Hypocalcemia in critically ill patients. *Crit Care Med* 1992;20:251-261.
- Carlstedt F, Lind L. Hypocalcemic syndromes. *Crit Care Clin* 2001;17:139-153.