

Hypomagnesemia

Definition

- Serum Mg^{++} <1.8 mg/dL

Etiology:

- Malnutrition (assoc. with heavy chronic alcohol use causing renal wasting)
- Malabsorption or diarrhea/GI loss
- PPI induced
- Renal losses (polyuria and high tubular flow, e.g., osmotic diuresis, post-ATN diuresis)
- Hypercalcemia (e.g. hyperparathyroidism)
- Loop and thiazide diuretic associated
- Proximal tubular toxins (e.g. aminoglycosides, amphotericin, cisplatin)
- Calcineurin inhibitors (tacrolimus > cyclosporine)
- Volume expansion (reduced Mg^{++} reabsorption due to reduced Na and H_2O reabsorption)
- Gitelman and Bartter syndromes
- Uncontrolled DM, post-parathyroidectomy (Hungry bone syndrome)

Clinical manifestations:

- NM hyperexcitability (tremor, tetany, convulsions), weakness, delirium, coma
- CV (widening QRS, peaked T waves, wide PR interval, atrial and ventricular arrhythmias)
- Hypocalcemia, hypoparathyroidism, PTH resistance, and decreased calcitriol synthesis

Evaluation:

- Order CMP, serum Mg^{++} and Phosphorus level
- Review patient history, clinical circumstances, nutritional status and medications

Management: PowerChart "Electrolyte Replacement Protocol"

Approach to Rx:

Patients with no or minimal symptoms:

- PO repletion recommended if able to tolerate
- Can give IV if unable or have GI side effects (discomfort, diarrhea)
- Typical daily PO dose in patients with normal renal function is 240-1000mg (20-40 mEq of elemental Mg^{++} in divided doses

Patients with severe symptoms: tetany, arrhythmias, seizure

- 1-2 grams (8-16 mEq) Magnesium sulfate bolus over 2-15mins if hemodynamically unstable (including those with arrhythmias consistent with torsade de pointes or hypomagnesemic hypokalemia). Repeat bolus if remains hemodynamically unstable
- If hemodynamically stable, give 1-2 grams Magnesium sulfate in 50-100mL of D5W over 5-60mins followed by infusion of 4-8 grams MgSulfate slowly over 12-24 hrs
- Adjust dose in AKI and CKD due to risk for severe hypermagnesemia
- Measure serum Mg 6-12 hrs after each IV dose and adjust dose accordingly

For routine IV or maintenance repletion, use the following estimated repletion doses:

- If the plasma Mg^{++} is < 1 mg/dL, give 4 to 8 grams (32 to 64 mEq of magnesium sulfate over 12 to 24 hours and repeat as needed.
- If the plasma Mg^{++} is 1 to 1.5 mg/dL, give 2 to 4 grams (16 to 32 mEq of magnesium sulfate over 4 to 12 hours.
- If the plasma Mg^{++} is 1.6 to 1.9 mg/dL, give 1 to 2 grams (8 to 16 mEq of magnesium sulfate over 1 to 2 hours.

(Conversion relationships: 1 mmol = 2 mEq = 24 mg of elemental magnesium = 240 mg magnesium sulfate.)

Key Points:

- Correct the underlying disease
- Correct Mg^{++} based on severity of hypomagnesemia and symptoms if any
- Great caution should be exercised when treating hypomagnesemia in AKI and CKD patients due to the increased risk for severe hypermagnesemia
- Replacement therapy with IV magnesium in patients with arrhythmias or NM symptoms