Magnesium and Potassium Deficiency

Magnesium is an essential cation, involved in many enzymatic reactions, as a cofactor to adenosine triphosphatases. It is critical in energy-requiring metabolic processes, as well as protein synthesis and anaerobic phosphorylation. Serum Mg concentration is maintained within a narrow range by the kidney and small intestine since under conditions of Mg deprivation both organs increase their fractional absorption of Mg. If Mg depletion continues, the bone store contributes by exchanging part of its content with extracellular fluid (ECF).

The serum Mg can be normal in the presence of intracellular Mg depletion, and the occurrence of a low level usually indicates significant Mg deficiency. Hypomagnesemia is frequently encountered in hospitalized patients and is seen most often in patients admitted to intensive care units. The detection of Mg deficiency can be increased by measuring Mg concentration in the urine or using the parenteral Mg load test. Hypomagnesemia may arise from various disorders of the gastrointestinal tract, conditions affecting Mg renal handling, or cellular redistribution of Mg. The gastrointestinal causes include the following: protein-calorie malnutrition, the intravenous administration of Mg-free fluids and total parenteral nutrition, chronic watery diarrhea and steatorrhea, short bowel syndrome, bowel fistula, continuous nasogastric suctioning, and, rarely, primary familial Mg malabsorption. The renal causes include Bartter's and Gitelman's syndrome, post obstructive diuresis, post acute tubular necrosis, renal transplantation, and interstitial nephropathy. Many therapeutic agents cause renal Mg wasting and subsequent deficiency. These include loop and thiazide diuretics, aminoglycosides, cisplatin, pentamidine, and foscarnet. Magnesium deficiency is seen frequently in alcoholics and diabetic patients, in whom a combination of factors contributes to its pathogenesis. Hypomagnesemia is known to produce a wide variety of clinical presentations, including neuromuscular irritability, cardiac arrhythmias, and increased sensitivity to digoxin. Refractory hypokalemia and hypocalcemia can be caused by concomitant hypomagnesemia and can be corrected with Mg therapy. The dose and route of administration of Mg in the treatment of hypomagnesemia is dictated by the clinical presentation, the degree of Mg deficiency, and the renal function.

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