Hypomagnesemia and Hypokalemia: Considerations for Cancer Care

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Electrolyte imbalances can frequently occur among patients with cancer. Hypomagnesemia and hypokalemia are side effects of certain chemotherapies, including cisplatin, cetuximab, eribulin, and ifosfamide. When patients concurrently receive chemotherapy and take medications that cause hypomagnesemia or hypokalemia, electrolyte imbalances are amplified. Provider and patient education are vital to identifying and treating these conditions in a timely manner. If medication usage depletes electrolytes, repletion through diet and supplements is essential. In symptomatic cases of electrolyte deficiency, oral and IV formulations of potassium and magnesium are options for treatment. This article discusses the importance of identifying and understanding the etiologies, symptoms, and treatment modalities of hypomagnesemia and hypokalemia.

AT A GLANCE

- Because hypomagnesemia can lead to potassium wasting, it should be addressed before correcting hypokalemia.
- Potassium should not be administered undiluted or by IV push as this can cause fatal cardiac arrest. The maximum rate of peripheral administration is 10 mEq per hour.
- Oral magnesium formulations vary in elemental magnesium amounts and in absorption rates.

KEYWORDS
hypomagnesemia; hypokalemia; electrolyte imbalance; chemotherapy side effects

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Electrolyte imbalances are caused by chemotherapy-related malnutrition, malabsorption, nausea, and vomiting, and can be a side effect of some chemotherapy medications. Electrolytes are essential for the regulation of physiological functions such as muscle contractions, neurologic functions, and acid balance. They are acquired from a balanced diet and can be depleted via the loss of body fluids (Flurie, 2020). Hypokalemia and hypomagnesemia, two common chemotherapy-induced electrolyte disorders, can interfere with treatment and cause delays in patients' progress (Lewis, 2021a, 2021b). The causes of these electrolyte imbalances are often multifactorial and depend on the type of chemotherapy used (Rosner & Dalkin, 2014).

Hypomagnesemia

Magnesium is a regulator of ion channels and is a component of numerous enzymatic reactions (Chernecky & Murphy-Ende, 2009). The second most abundant intracellular cation found in the human skeletal structure, magnesium is absorbed via the small intestine and the kidney (Flurie, 2020; Roller et al., 2017). About 60% of the body's magnesium is stored in the bones, and the rest is stored in the muscles (Brown, 2015; Reed et al., 2012). Hypomagnesemia is a serum concentration of magnesium lower than the normal range (1.5–2.5 mg/dl) and is divided into the following five grades (National Cancer Institute Cancer Therapy Evaluation Program, 2017):

- Grade 1: less than the lower limit of normal to 1.2 mg/dl
- Grade 2: less than 1.2 to 0.9 mg/dl
- Grade 3: less than 0.9 to 0.7 mg/dl
- Grade 4: less than 0.7 to 0.3 mg/dl
- Grade 5: death

Etiologies of hypomagnesemia include poor absorption of magnesium in the gastrointestinal (GI) tract, low oral intake of magnesium-containing food, alcohol use, and renal impairment (Flurie, 2020; Lewis, 2021b; Yu et al., 2021). Some medications contribute to hypomagnesemia, including the chronic use of proton pump inhibitors, such as omeprazole and lansoprazole; diuretics, such as furosemide, hydrochlorothiazide, and acetazolamide; anti-infectives, such as aminoglycosides, amphotericin B, and itraconazole; bisphosphonates, such as ibandronate and zoledronic acid; and laxatives, such as docusate and lactulose (Brown, 2015). Chemotherapy agents such as cisplatin and cetuximab can cause tubular damage in the kidneys, resulting in decreased magnesium absorption (Oronsky et al., 2017; Rosner & Dalkin,