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Chang, et al. Calcium, Magnesium and Phosphate Abnormalities in the Emergency Department. Emergency Clinics of N America. 2014 Feb; 32(1):349-366

BLUF:

Calcium, magnesium and phosphate abnormalities are frequently seen in the ED. It is important to understand the role of these electrolytes in physiologic processes, their disorders, and the correct management.

Objective:

This was an informational review of these electrolytes and their disorders from a journal focusing on topical rotating clinical reviews.

Discussion:

The authors discuss the physiology then pathophysiology of calcium, magnesium and phosphate briefly then delve into specifics about excess and depleted states of each. These will be summarized in extreme brevity below.

Hypercalcemia: >80% caused by malignancy and hyperparathyroidism. Don't forget chronic kidney disease as a cause of the latter. The dictum of 'stones, grones and psychiatric overtones' holds true about signs/symptoms of hypercalcemia. In terms of management, volume repletion, loop diuretics are ER treatments of hypercalcemia. Remember to replace the diuresis-induced loss of other minerals.

Hypocalcemia: Caused by PTH deficiency, vitamin D def, blood transfusion (citrate binding), bicarb, acute respiratory alkalosis. Mild states are asymptomatic; carpopedal spasm and perioral numbness are signs of more severe states and the Chovstek and Trousseau signs are hallmark (but clinically not so useful). Seizures, movement disorders, confusion, hallucinations can occur. IV replacement with the usual calcium chloride/gluconate should be started for severe cases, replace orally for mild cases, treat hypomag and take care not to treat patients with concomitant hyperphosphatemia as these two will precipitate.

Hypermagnesemia: is rare and usually caused by renal failure. Also: lithium, hypothyroid, Addison and tissue breakdown (sepsis/burns). Neuromuscular symptoms predominate. Think mag checks on OB: decreased DTRs, muscle weakness, apnea, hypotension, bradycardia, n/v, flushing, and hypocoagulability. If it is causing such symptoms treat with calcium and dialyze or diurese.

Hypomagnesemia: this is way more common than excess magnesium and is caused by decreased absorption or increased loss. Alcoholics are often deficient due to diet. Hyperthyroid and hypoparathyroid states, diuretics, antibiotics, digoxin, chemo and immunosuppressants can cause it. You will see deficiencies in other electrolytes. It will cause weakness, tremors, seizures, arrhythmias, torsade de pointes. IV mag sulfate should be given for severe cases, with replacement of other electrolytes as well. It is excreted readily, so ongoing oral replacement should be arranged.

Hyperphosphatemia: usually caused by decreased excretion (renal patients), increased absorption from the GI tract, though an overdose is very unlikely. Vitamin D can potentiate absorption and reabsorption from GI/renal systems, respectively. Other causes include tumor lysis, rhabdo, hemolysis, hyperthermia and leukemia. It is usually asymptomatic--until it begins to bind and decrease calcium levels, which can eventually precipitate in vessels. To treat it you need to add phosphate binders to inhibit GI uptake. Dialysis, diuresis and IVF also work acutely.

Hypophosphatemia is caused by opposite forces--decreased uptake or increased urinary excretion. Diarrhea, malnutrition and vitamin D deficiency decrease intake. Hyperparathyroidism and diuresis account for the main causes of renal loss. It can present as severe weakness which can ultimately affect the cardiac and respiratory

systems. Treating low phosphate is only necessary in severe cases. Oral replacement is best, as IV phosphate often precipitates, but potassium and sodium salts work, and it should be replaced slowly (1-3 mmol/h).

Conclusion: Know your electrolytes. Disorders of calcium, mag and phosphate aren't common in the ED but a working knowledge of their effects and treatments is important in both diagnosis of underlying conditions and treatment in the ED.
