

Magnesium & Drug Interactions

Anesthetic Pearls: Anesthetic Implications and Management of Magnesium

Magnesium is the 11th most abundant element by mass in the human body (fourth most important **cation** in the body and the second most important intracellular cation after potassium). The ions of magnesium are essential to all living cells. They play a major role in manipulating important biological polyphosphate compounds such as ATP, DNA, and RNA. Only 1% of magnesium resides in the extracellular fluid compartment and of this amount, only 30% is bound to protein. Normal plasma concentrations of magnesium are achieved and maintained by absorption from the small bowel. The excretion of magnesium is almost entirely from the kidneys. Magnesium strongly influences cardiac cellular membrane ion transport functions and is essential for activating greater than 300 enzyme systems (including most enzymes involved in energy metabolism). Presynaptic release of acetylcholine at the nerve terminal also depends on the actions of magnesium.

Calcium / Magnesium Balance

Magnesium is a regulator of calcium transport into cells and the action of calcium inside cells. This intracellular regulation of calcium by magnesium causes an activation of cell membrane pumps that extrude calcium. Magnesium also competes with calcium for transmembrane channels transport into the cells and is therefore a natural physiologic antagonist of calcium.

Drugs Interactions caused by HyperMagneemia (Potentiation):

1. Beta blockers – may lead to profound bradycardia & hypotension
2. Calcium channel blockers – may lead to profound bradycardia & hypotension
3. Succinylcholine (not a consistent observation)
4. Effects of CNS sedatives
5. Narcotics
6. Volatile anesthetics
7. Nondepolarizing muscle relaxants

Magnesium & The Nervous System

Magnesium inhibits release of acetylcholine from cholinergic nerve terminals. The usual dose of nondepolarizing muscle relaxants should be reduced by one-half to one-third in patients who are receiving infusions of magnesium sulfate. Magnesium by itself also acts as a mild muscle relaxant. Patients receiving magnesium sulfate infusions may NOT demonstrate fasciculations after administration of Succinylcholine.