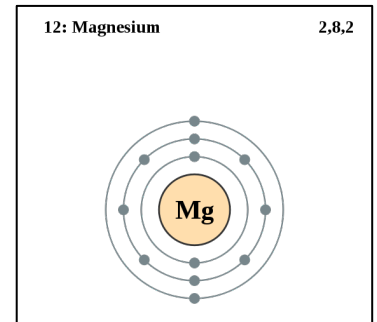


Magnesium Sulfate

Anesthetic Pearls: Anesthetic Implications and Management of Magnesium Sulfate

General Info: The tocolytic effects of Magnesium were first reported in 1959 and has since become the tocolytic of choice in many medical centers. Experiments have shown that strips of myometrium excised from gravid human uteri exhibited reduced contractility in the presence of magnesium ions. There are also reports of prolonged labor in pregnancy induced hypertension (PIH) patients on Magnesium therapy for seizure prophylaxis.



Mechanisms of Action: The true mechanism of action is largely unknown but is described as "nature's physiologic calcium blocker". Researchers believe that Magnesium competes with Calcium for surface-binding sites on smooth muscle membranes and secondly prevents the increase in the free intracellular calcium concentration that is necessary for myosin light-chain kinase activity. Magnesium also works at the level of the neuromuscular junction by decreasing the release of acetylcholine.

Magnesium Therapy

Normal plasma level: 1.5-2.0 mEq/L.

Therapeutic range: 4 – 8 mEq/L.

ECG changes: 5-10 mEq/L (prolonged pQ interval and widened QRS complex).

Loss of tendon reflexes: > 10 mEq/L.

Respiratory paralysis: > 15mEq/L.

Cardiac arrest: > 25 mEq/L.

Side Effects: Chest pain, chest tightness, and nausea / vomiting. Pulmonary edema (worse if combined tocolytic therapy using Terbutaline). In addition, all the negative changes that go with increased levels of Magnesium as seen above. In the presence of renal impairment, magnesium concentrations may rapidly reach toxic levels.

Anesthetic Considerations: Should there be a delay between the discontinuation of Magnesium and the administration of regional anesthesia because of the ability of magnesium to cause hypotension? General consensus believes that it is ok to continue with both an epidural and spinal; however activation of epidural should be slower. One study showed that Magnesium decreased maternal blood pressure but not uterine blood flow or fetal oxygenation during epidural anesthesia (Lidocaine as local agent) in gravid sheep. Patients who are receiving Magnesium are more sensitive to both depolarizing and non-depolarizing muscle relaxants. Patients should not be pretreated with non-depolarizer before Succinylcholine as a paralytic. The Succinylcholine dose given should not be less than 1 mg/kg. If additional muscle relaxant is needed, slow titration is advised with the help of a nerve stimulator. Patients on Magnesium often appear sedated with decreased affect. An increased plasma concentration of Magnesium is associated with nonlinear reductions of Halothane MAC unrelated to sex or pregnancy in both pregnant and non-pregnant rats. They observed a 20% reduction in MAC with plasma Magnesium levels of 7-11 mg/dl. More recent studies confirm that Magnesium therapy can cause a reduction in the MAC of all the halogenated agents up to 20%.