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ST VINCENT'S PATHOLOGY

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MAGNESIUM INFORMATION SHEET

PHYSIOLOGY

Magnesium is an intracellular cation. it is essential for enzyme activity, for the synthesis of nucleic acids, fatty acids proteins and glucose utilisation. It also has an important physiological role in the neuromuscular and cardiovascular systems as well as being involved in almost all hormone reactions. Total body magnesium is approximately 1000 mmols, of which 60% is in bone, 20% in skeletal muscle, and less than 1% in the extracellular fluid. In the circulation, 65% of serum magnesium is free (ionised), about 20% is protein bound, and the rest is complexed with various anions (eg: phosphate and citrate). The body magnesium balance is regulated by intestinal absorption (predominantly in the ileum and colon), and renal reabsorption which ocurrs both passively (65-75% in the thick ascending loop of Henle and 15-20% in the proximal tubules) and actively (5-10% in the distal convoluted tubule). The most commonly used method for assessing magnesium status is serum magnesium concentration. Spot or 24-hour urine magnesium may be useful in determining renal or intestinal wasting especially in the setting of hypomagnaesemia.

HYPOMAGNESAEMIA

Hypomagnesaemia is common (7-11%) in hospital patients, and the prevalence is higher in critically ill patients. It often coexists with other electrolyte disturbances, especially in the setting of hypokalaemia, hypophosphataemia, hyponatraemia, or hypocalcaemia. Low serum magnesium may be a cause of hypocalcaemia due reduced PTH secretion and activity.

CAUSES OF HYPOMAGNAESEMIA	
Redistribution of magnesium	• Refeeding syndrome • Hungry bone syndrome • Insulin therapy (eg Rx of DKA) • Correction of acidosis • Catecholamine excess • Massive blood transfusion
Gastrointestinal Causes	• Reduced intake (can also occur with parenteral nutrition) • Reduced absorption (eg: malabsorption, chronic diarrhoea, intestinal resection, proton pump inhibitors)
Renal Loss	• Drugs: Diuretics (eg thiazides, frusemide) Aminoglycoside (eg: Gentamicin) Cytotoxics (eg: cisplatin, carboplatin) Amphoterocin Cyclosporin, tacrolimus

	• Renal Disease Post obstructive nephropathy Post renal transplantation Dialysis Diuretic phase of acute renal failure Inherited disorders (eg: Bartter's and Gitelman's syndromes)
Alcoholism	

CAUSES OF HYPERMAGNESAEMIA

Hypermagnesaemia most commonly occurs due to excessive administration of magnesium salts or magnesium-containing drugs (eg: antacids), especially in patients with renal impairment. Mild elevations of serum magnesium are usually asymptomatic. Hypotension and depressed reflexes seen with concentrations over 3 mmol/L. Very high serum magnesium concentrations are usually iatrogenic with serum levels > 4mmol/L associated with paralysis, hypotension, bradycardia, cardiac arrest.

CAUSES OF HYPERMAGNAESEMIA	
Decreased renal excretion	• Reduced kidney function • Familial hypocalciuric hypercalcaemia • Lithium ingestion
Excess intake	• Treatment of specific conditions (eg pre-eclampia) • Parenteral dosing error • Magnesium containing antacids or cathartics
Other causes	• Theophylline toxicity • Hypothyroidism • Rhabdomyolysis • Addison's disease