TREATMENT OF ACUTE HYPOMAGNESAEMIA IN ADULTS

Limitations

There are no national guidelines for the treatment of acute hypomagnesaemia, and practice varies widely across UK Hospital Trusts. The dose and route of magnesium to correct hypomagnesaemia should be determined on an individual patient basis. This guidance is not intended for patients with impaired renal function or in critical care unit where specialist advice should be sought.

The interpretation and application of these guidelines remain the responsibility of the clinician. If in doubt, a senior colleague should be contacted.

Background

The plasma contains only approximately 0.3% of total body magnesium and the serum magnesium levels does not always correlate with the total magnesium stores in the body. Serum concentrations should therefore be used in conjunction with presenting signs and symptoms to diagnose hypomagnesaemia.

The reference range for serum magnesium is 0.7-1.0mmol/L. Hypomagnesaemia should be corrected over about 5 days since magnesium equilibrates slowly within intracellular compartments.

Hypomagnesaemia often causes secondary hypocalcaemia, and also hypokalaemia and hyponatraemia. Therefore correction of magnesium may aid the correction of other electrolytes.

Sign and Symptoms

- Neuropsychiatric: psychosis, agitation, confusion, delirium, seizures, depression
- Neuromuscular: tetany, tremors, small muscle contractions, fasciculations, weakness
- Cardiovascular: ECG changes, cardiac arrhythmias
- Other: nausea, vomiting, hypocalcaemia, hypokalaemia, hyperinsulinism

Causes

- Inadequate dietary intake
- Refeeding syndrome
- Ulcerative colitis
- Endocrine disorders, e.g. hyperaldosteronism, diabetic ketoacidosis
- Vomiting & diarrhoea
- Chronic alcoholism
- Long- term IV nutrition or fluid therapy
- Renal tubular reabsorption defects
• Drainage from fistulas
• Bypass surgery
• Intestinal resection
• Malabsorption
• Lactation
• Acute pancreatitis
• Purgative abuse
• Drugs e.g. proton pump inhibitors, thiazides, loop diuretics, aminoglycosides, cisplatin, amphotericin, theophylline, ciclosporin, tacrolimus

Severity

• Mild: Mg\(^{2+}\) ≥ 0.5 - <0.7mmol/L
• Moderate to Severe: Mg\(^{2+}\) < 0.5mmol/L
  o Moderate: 0.3 - 0.5mmol/L is a possible medical emergency
  o Severe: <0.3mmol/L should be treated urgently (life threatening)

Assessments and Investigations

• Bloods- FBC, U&Es, Magnesium, Calcium

Initial Management

• Establish the cause of the hypomagnesaemia and correct if possible (i.e. review medications and where appropriate stop drugs which may cause hypomagnesaemia)
• The dose of magnesium to correct hypomagnesaemia should be determined on an individual patient basis
• Concomitant hypokalaemia or hypocalcaemia should also be checked and corrected as appropriate

Treatment

Mild, asymptomatic hypomagnesaemia
Mg\(^{2+}\) 0.5 - 0.7mmol/L

• Establish the cause of the hypomagnesaemia and correct if possible (i.e. review medications and where appropriate stop drugs which may cause hypomagnesaemia)
• Monitor patient and treat if becomes symptomatic, or following a clinical risk/benefit decision
Moderate to Severe hypomagnesaemia
Mg$^{2+}$ < 0.5 mmol/L

Oral treatment

Magnaspartate® (magnesium aspartate dihydrate) 243 mg powder for oral solution: Give 1 - 2 sachets daily in divided doses. Contents of each sachet can be dissolved in 50-200ml of water, tea or orange juice. Each sachet contains 10mmol of magnesium.

MagnaPhos® (magnesium glycerophosphate) 5mmol/5ml oral solution: 8mmol three times a day for 3 days, dose expressed as Mg$^{2+}$. It should only be used where Magnaspartate® is unavailable.

NOTE:
Diarrhoea tends to limit the amount of magnesium that can be given orally; if diarrhoea develops, reduce the dose. Administering after food may also help to reduce the incidence of diarrhoea.

Intravenous treatment

Day 1: 40mmol Magnesium Sulphate 50% in 500ml glucose 5% (or sodium chloride 0.9%) over 6-12 hours
(If necessary 20mmol Magnesium Sulphate 50% may be given over 3 hours but is preferable to give over a longer period). No more than 40mmol daily.

Days 2-5: 20mmol Magnesium Sulphate 50% in 500mL glucose 5% (or sodium chloride 0.9%) over 6 hours. No more than 20mmol daily.

NOTE:
• 20mmol magnesium sulphate 50% (500mg/ml) $\equiv$ 10mL magnesium sulphate 50% injection
• 40mmol magnesium sulphate 50% (500mg/ml) $\equiv$ 20mL magnesium sulphate 50% injection
• Up to 160mmol magnesium (80ml or 40g) may be required over 5 days to correct the deficiency
• In fluid restricted patients, a fluid volume of 100ml may be used. Minimum dilution is 40mmol in 50ml glucose 5% (or sodium chloride 0.9%) but ideally dilute further to a convenient volume i.e. 40mmol in 250ml to 1L fluid.
Treatment of acute hypomagnesaemia in adults
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Review date: December 2022

### Available as:
- Magnesium sulphate 50% (500mg/ml) solution for injection 5g in 10ml (5g in 10ml magnesium sulphate = 20mmol Mg\(^{2+}\) in 10ml)
- Magnesium sulphate 50% (500mg/ml) solution for injection 2.5g in 5ml (2.5g in 5ml magnesium sulphate = 10mmol Mg\(^{2+}\) in 5ml)
- Magnesium sulphate 50% (500mg/ml) solution for injection 1g in 2ml (1g in 2ml magnesium sulphate = 4mmol Mg\(^{2+}\) in 2ml)

### Compatible fluid:
Glucose 5%, sodium chloride 0.9%

### For IV infusion:
- Magnesium sulfate 50% must ALWAYS be diluted before use and mixed thoroughly.
- Concentration should not exceed 20% (200mg/ml or 0.8mmol/ml Mg\(^{2+}\))

### Rate of infusion:
- Must not exceed 150mg/min (0.6mmol/min) but preferable to give as a slow IV infusion for hypomagnesaemia

### Monitor:
- Blood pressure, respiratory rate, heart rate, urinary output, signs of hypermagnesaemia, magnesium, calcium and other electrolyte plasma levels.
- Parental magnesium therapy should be avoided in patients with heart block or myocardial damage.
- It may be appropriate to give oral magnesium supplements after initial intravenous administration

### Monitoring
- Monitor serum magnesium concentration regularly during IV treatment and oral therapy.
- Patient receiving digoxin should be monitored closely for acute digitalis toxicity.
- Magnesium is renally cleared and should be used with caution in patients with renal impairment (especially when given IV) as they are at a higher risk of adverse effects. In practice, monitor patient cautiously for hypermagnesaemia or signs of magnesium intoxication and adjust the dose and frequency of administration accordingly.

### References
7. Personal Correspondence. Neoceuticals Ltd for NeoMag 4 mmol chewable tablets. 03/09/2020


