

**Use**

Magnesium sulphate is now widely used to prevent or control eclamptic convulsions. It is also used to treat neonatal hypomagnesaemia and late neonatal hypocalcaemia. Use does *not* prevent preterm labour.

**Pharmacology**

Maternal treatment is the treatment of choice for eclampsia, and for *pre*-eclampsia severe enough for urgent delivery to be contemplated, and follow up studies show that there are no long-term disadvantages associated with the obvious short term benefit. It reduces the risk of maternal seizures and probably lowers maternal mortality, but it does nothing to lower blood pressure or reduce perinatal mortality. Treatment with magnesium sulphate is still widely used to inhibit preterm labour in North America, although there is no controlled trial evidence of benefit, and increasing evidence that high dose treatment may have adverse consequences for the baby. Even short term use increases the fetal, as well as the maternal, plasma magnesium level, causing hypotonia, reduced gastrointestinal motility and mild respiratory depression, and treatment with gentamicin after birth could exacerbate this hypotonia. Three trials have, however, found that brief use reduces the risk of severe cerebral palsy when given for just 12–24 hours to mothers in strong well-established preterm labour (see web commentary). Two small trials also suggests that use may lessen the early symptoms of perinatal asphyxia in the term baby. Breast feeding does not need to be discouraged because of maternal treatment.

Magnesium levels above 4 mmol/l are sedative, causing muscle relaxation and significant pulmonary and systemic vasodilatation. Following a number of encouraging observational studies continuous infusions are now sometimes used in ventilated babies with persistent pulmonary hypertension unresponsive to tolazoline (q.v.). No controlled trial of this strategy has yet been mounted. Improvement is variable, and babies showing no sustained response should be managed in a unit able to offer treatment with nitric oxide (q.v.). A similar strategy seems to reduce the need for other medication in adults with severe tetanus.

Symptomatic neonatal hypocalcaemia (a serum calcium less than 1.7 mmol/l) is now rare, and usually associated with hypomagnesaemia. Empirical data suggest that children treated with IM magnesium sulphate improve more quickly than children given calcium gluconate (q.v.).

**Maternal use**

**Preventing or treating eclampsia:** Give 4 g IV over 15 minutes followed by 1 g/hr IV for up to 24 hours. In countries where sustained IV treatment could be problematic give 5 g IM once every 4 hours.

**Reducing the risk of cerebral palsy:** Giving mothers facing imminent delivery before 30 weeks a 4 g IV loading dose and then a 1 g/hr infusion until delivery (but for no more than to 24 hours) has no impact on perinatal mortality, but does significantly reduce the risk of the baby developing serious cerebral palsy.

**Neonatal use**

**Hypocalcaemia:** Giving 100 mg/kg of magnesium sulphate (0.2 ml/kg of a 50% solution) deep IM on two occasions 12 hours apart will control most cases of symptomatic late neonatal hypocalcaemia.

**Hypomagnesaemia:** The same dose every 6–12 hours can also be used to treat primary neonatal hypomagnesaemia irrespective of the cause (normal plasma level: 0.75–1.0 mmol/l). This is usually given IV or IM because it is a purgative (like Epsom Salts) when given by mouth.

**Persistent Pulmonary Hypertension:** Give a loading dose of 250 mg/kg of magnesium sulphate IV over 10–15 minutes. If a clinical response is obtained once the serum magnesium level exceeds 3.5 mmol/l give between 20 and 75 mg/kg an hour for 2–5 days, while maintaining a blood level of between 3.5 and 5.5 mmol/l. This strategy has not yet been subjected to controlled trial evaluation.

**Intrapartum asphyxia:** Give a 250 mg/kg dose IV once a day for 3 days. Watch for respiratory depression.

**Supply and administration**

Magnesium sulphate is conventionally prescribed as the heptahydrate; 2 ml ampoules of 50% magnesium sulphate contain one gram (4.1 mmol) of magnesium, and cost £2.90. To give a baby a 250 mg/kg IV 'stat' dose, draw 1 g of magnesium sulphate (2 ml of the 50% solution) for each kilogram the baby weighs into a syringe, dilute to 20 ml with 10% dextrose saline to obtain a solution containing 50 mg/kg per ml, and give 5 ml of this solution slowly over 10–15 minutes. To then continue delivering 20 mg/kg per hour, give 0.4 ml/hour of the same solution. 20 ml (4 g) ampoules of a 20% solution costing £2.80 are available for use in adults.

**References**

See also relevant Cochrane reviews and UK guideline on pre-eclampsia © ⊗

Gurner TL, Cockburn F, Forfar. Magnesium therapy in neonatal tetany. *Lancet* 1977;i:283–4. [RCT]

Tolsa J-F, Cotting J, Sekarski N, *et al.* Magnesium sulphate as an alternative and safe treatment for severe persistent pulmonary hypertension of the newborn. *Arch Dis Child* 1995; 72:F184–7.

Grimes DA, Nanda KK. Magnesium sulfate tocolysis. Time to quit. *Obstet Gynecol* 2006;108:986–9.

Magpie Trial Follow-up Study Collaborative Group. The Magpie trial: a randomised trial comparing magnesium sulphate with placebo for pre-eclampsia. Outcome for children at 18 months. *Br J Obstet Gynaecol* 2007;114:300–9. [RCT] (See also 289–9.)

Rouse DJ, Hirtz DG, Thom E, *et al.* A randomized controlled trial of magnesium sulfate for the prevention of cerebral palsy. *N Engl J Med* 2008;359:895–905. [RCT] (See also 962–4.)

Bhat MA, Charoo BA, Bhat JI, *et al.* Magnesium sulfate in severe perinatal asphyxia: a randomized, placebo-controlled trial. *Pediatrics* 2009;123:e7649. [RCT]

Duley L. Pre-eclampsia and hypertension. *BMJ clinical evidence handbook*. Dec 2008: 494–6 (and updates). [SR]