CLINICAL PRACTICE GUIDELINE

Magnesium Sulphate for Neuroprotection of the Fetus

This document should be read in conjunction with the Disclaimer

Quick Reference Guide

Prior to commencement of MgSO4:

- Provide information to the woman about the use of MgSO4
- Obtain verbal consent
- Two registered midwives must

1. Check the correct medication, dose and infusion rate
2. Set up the infusion line and pump

Before commencement check and document that

- the knee or tendon reflex is present
- the RR is > 12 respirations per minute

Commence the infusion.

MgSO4 Loading Dose Regimen

Infuse 4grams of MgSO4 over 20 minutes.

This equates to an infusion rate of **150mL per hour for 20 minutes/ the woman receives only 50mL of the infusion.** A solution of 8 grams of MgSO4 in a 100mL bag is used at KEMH. Always use an infusion pump. Err on the side of caution when a woman who has been treated with Nifedipine requires a MgSO4 bolus.

MgSO4 Maintenance Regimen

The dose for maintenance infusion is 1gram of MgSO4 per hour for **4 hours**.

This equates to an **infusion rate of 12.5 mL per hour** where the solution of 8 grams of MgSO4 in 100mL bag is used at KEMH. Always use an infusion pump.

Maternal Observations

- Monitor Patella reflexes, RR and BP every **15 minutes** for the first **two** hours, then hourly after.
- Monitor Oxygen saturations continuously with a pulse oximeter and record hourly.
- Measure and record urine hourly- ensure output is over > 25mL/ hr.

WHEN TO CEASE INFUSION/ NOTIFY MEDICAL OFFICER-

- If patella reflexes are absent
- If respirations are less than 12 per minute
- If urine output is less than 25mL/ hr
- If a major side effect is witnessed, such as respiratory depression.

Additional Information-

1. MgSO4 is only given to women who are at imminent risk of delivery of a preterm infant of less than 30 weeks gestation and birth is planned or definitely expected within 24 hours. Ideally it should be commenced **4 hours prior** to delivery.
2. Urgent delivery for fetal or maternal indications should not be delayed in order to achieve MgSO4 administration.
3. Calcium gluconate 1g in 10 mL must be available at all times for treatment of MgSO4 toxicity. Resuscitation equipment should be readily available.
4. Apply continuous fetal monitoring.

Aim

To reduce the incidence of cerebral palsy as a complication of very preterm birth by the administration of magnesium sulphate in preterm labour.

Background information

Cerebral Palsy (CP) is a motor and or postural dysfunction which is not progressive and may be associated with cognitive impairment. CP has a prevalence of 2:1000 live births and the principal obstetric risk factors for CP are preterm birth (before 34 weeks) and low birth weight. Magnesium sulphate ($MgSO_4$) administration to the preterm fetus has been linked with the prevention of CP since 1995. A Cochrane meta-analysis review in 2009 concluded that antenatal $MgSO_4$ therapy given to women at risk of preterm birth substantially reduced the risk of CP in their child (RR .68 CI .54-.87, five trials, 6145 infants). The National Practice guideline recommends restriction of the administration of $MgSO_4$ to the group of fetuses less than 30 weeks gestation, as this was the group to show the maximum benefit. Number needed to treat (NNT) to benefit one baby was 63: NNT at less than 28 weeks gestation 29.

Pathophysiology

The exact mechanism for potential neuro protection is not known but the following pathways have been postulated

- $MgSO_4$ down regulates excitatory stimuli, by blocking NMDA receptors in the brain.
- Vasoactive properties of $MgSO_4$ may improve cerebral blood flow.
- $MgSO_4$ had been shown to prevent neuronal injury from pro inflammatory cytokines which may be involved in the genesis of preterm birth.
- Magnesium may have an anti-apoptotic (programmed cell death) effect reducing neuronal loss.

Key points

1. $MgSO_4$ is given to women who are at imminent risk of early preterm birth, and are less than 30 weeks gestational age (i.e. 29+6 or less weeks), to achieve a degree of neuro protection of the fetus.
2. $MgSO_4$ should be given when early preterm birth (less than 30 weeks) is planned or definitely expected within 24 hours. In the planned birth, it is recommended $MgSO_4$ be commenced 4 hours prior to delivery.
3. In the unplanned delivery, $MgSO_4$ should only be given when the woman is in active preterm labour, with the patient in Labour and Birth Suite (L&BS).
4. $MgSO_4$ for neuro protection should be given in pregnancies less than 29 + 6, regardless of whether pregnancy is single or multiple, regardless of parity, regardless of anticipated mode of delivery and whether or not corticosteroids have been given.
5. Regimen for the administration of $MgSO_4$ is 4g over a 20 minute period, continue at 1g/hour for 4 hours then cease infusion. See Guideline Magnesium sulphate anticonvulsant therapy. If the birth occurs before the 4 hour mark, discontinue the infusion at the time of birth.
6. Urgent delivery for fetal or maternal indications should not be delayed in order to achieve $MgSO_4$ administration.

Procedure

1. Prior to commencement of $MgSO_4$, assess the woman in threatened preterm labour or preterm labour. Perform a fFN test as part of the assessment. If it is negative, and in the absence of cervical change or ruptured membranes, then $MgSO_4$ infusion is not appropriate at this time and management should be as per the Preterm Labour guideline. The absence of fetal fibronectin (fFN) in the cervical secretions is a very useful negative predictor of imminent birth (negative predictive value for birth within 7 days 97-98%). See Clinical Guideline Preterm Labour.
2. Confirm gestational age from previous ultrasound scanning or if no early scan available, from LMP if this is felt to be accurate. In the unbooked patient, who has had no antenatal care, a late scan may be used to determine gestational age.
3. If the patient is less than 30 weeks, determine if delivery is considered to be imminent i.e. evidence of cervical dilatation, ongoing contractions which are not settling with tocolysis and / or there is evidence of progressive effacement and dilatation.
4. Discuss with Obstetric consultant for L&BS/senior registrar/level 4 registrar or above.
5. Transfer the patient to the Labour and Birth Suite (L&BS) as per the management of preterm labour and commence the administration of $MgSO_4$.
6. Clinical care of the woman and fetus as outlined below
7. In the case of a planned preterm (<30 weeks gestation) delivery, transfer the patient to Labour and Birth Suite or the Adult Special Care Unit (ASCU), whichever is most appropriate and commence $MgSO_4$ regime 4 hours prior to anticipated time of delivery.

Antenatal Magnesium Sulphate Infusion

- The solution used at KEMH is **8g of $MgSO_4$ in a 100ml pre-packaged solution. This must be given via an infusion device.**
- Administer intravenous loading bolus dose of 4g of $MgSO_4$ over 20 minutes via a controlled infusion device. This equates to an infusion rate of 150mL/hour for 20 minutes (i.e. the woman only receives 50 mL)
- Err on the side of caution when a woman who has been treated with Nifedipine requires a MgSO4 bolus.
- The loading dose is followed by a maintenance infusion of 1g of $MgSO_4$ per hour. When the rate is changed to the maintenance rate, the rate shall be checked and confirmed by 2 registered midwives. This equates to an infusion rate of 12.5mL per hour.
- Continue at 1g/hour for 4 hours then cease $MgSO_4$ infusion. If the birth occurs before the 4 hour mark, discontinue the infusion at the time of birth.
- Prior to the commencement of $MgSO_4$ infusion ensure:
  - patella reflexes are present
  - respirations are more than 12 per minute
  - The correct order, medication, dose, and infusion rate is checked by 2 registered midwives.

- Calcium Gluconate 1g in 10 mL (2.2mmol calcium in 10mL) must be available at all times for treatment of $MgSO_4$ toxicity.
  - Dose – administer ONE ampoule of Calcium gluconate 1g in 10mL(2.2mmol calcium in 10mL) intravenously (IV) slowly. Administration must be authorised by a medical officer.
  - ECG monitoring is recommended if Calcium gluconate is given
- Apply continuous fetal monitoring.

Maternal observations

Patella reflexes

Perform every 15 minutes for the first 2 hours, then hourly thereafter.

If patella reflexes are absent:

- Cease the infusion
- Notify the medical officer
- Collect blood for serum Magnesium levels

Respiratory rate and oxygen saturation monitoring

Monitor respirations 15 minutely during the first 2 hours, then hourly thereafter.

If respirations are less than 12 /minute:

- Notify the medical officer
- Cease the infusion until medical review
- Place the woman in the recovery position
- Maintain the airway and administer O_2 at 6-8L/minute
- Administer IV Calcium gluconate 1g in 10mL (2.2mmol calcium in 10mL)slowly. Monitor heart rate with an ECG if available, or apply as soon as possible.
- Collect blood for serum magnesium levels

Monitor maternal O2 saturation levels continuously with a pulse oximeter.

Record O_2 saturation levels hourly.

If respiratory arrest occurs:

- Stop infusion
- Call a code blue medical
- Initiate respiratory support until the woman is intubated and ventilated

Monitor urine output

Measure and record urine output hourly.

If urine output is <25mL/hour:

- Notify the medical staff

Blood pressure

Monitor BP 15 minutely during the infusion for the first 2 hours, thereafter hourly.

Review of $MgSO_4$ infusion

Report any side effects of $MgSO_4$ to the medical officer.

References

1. Antenatal magnesium sulphate for Neuro protection of the fetus and child- **National Clinical Practice Guidelines Feb 2010.**

2. Doyle LW, Crowther CA, Middleton P et al. Antenatal Magnesium Sulphate and Neurological Outcomes in Preterm Infants: A Systematic Review. **Obstetrics and Gynaecology, 113(6): 1327-1333, June 2009.**

Related WNHS policies, procedures and guidelines

Preterm Labour

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