MATERNITY UNIT
GUIDELINE:

MAGNESIUM SULPHATE USE FOR IMMINENT PRETERM BIRTH < 32 WEEKS GESTATION - NEUROPROTECTION

SCOPE:
All Midwives and Obstetricians working in the Maternity Unit

AUTHOR:
Midwife Educator

PURPOSE:
Magnesium sulphate is of proven benefit for neuroprotection in infants born <32 weeks gestation. This guideline covers the indications for its use and a protocol for its administration.

INTRODUCTION:
- Magnesium sulphate is the treatment of choice and should be administered as soon as possible and should not be delayed even if transfer to a tertiary centre is planned.
- The most recent Cochrane review (Doyle 2009) concludes that antenatal magnesium sulphate therapy given to women at risk of preterm birth substantially reduces the risk of cerebral palsy in their children.
- Over 120 children are diagnosed with cerebral palsy each year in New Zealand and approximately 45% of all cases of cerebral palsy are related to preterm birth.
- Australia and New Zealand National Clinical Practice Guidelines were published in March 2010 (The Antenatal Magnesium Sulphate for Neuroprotection Guidelines Development Panel 2010). These guidelines recommend consideration of the antenatal use of magnesium sulphate in women at risk of imminent preterm birth < 32 weeks regardless of plurality (number of babies in utero), parity, reason for early delivery, anticipated mode of delivery and whether or not antenatal corticosteroids have been used.

GUIDELINE:
Contraindications and Precautions
- Magnesium sulphate is incompatible with Aminophylline, Sodium Bicarbonate, any calcium preparations and Chlorpromazine.
- Nifedipine must be used with caution due to possible severe hypotension
- Voltaren should be used with caution.

Magnesium Sulphate Use:
- The decision to give magnesium sulphate for women at risk of imminent preterm birth should be made on an individual basis and involve discussion with the on call Obstetrician.
- Delivery is defined as imminent when early delivery is planned or definitely expected within 24 hours (if birth is planned commence magnesium sulphate as close to four hours before birth as possible). Do not delay starting magnesium sulphate in eligible women who may deliver within a few hours – the sooner the better and there is benefit even if a full 4 hours is not given.

- Magnesium sulphate should be administered for neuroprotection of the fetus in the following situations:
  - Where delivery is expected in the next 24 hours
  - Up to 31+6 weeks gestation
- This includes delivery due to maternal or fetal compromise when transfer to a tertiary centre is considered inadvisable and when delay will not further compromise mother or fetus. Imminent delivery includes women in progressive preterm labour i.e. advanced cervical dilatation (> 3cm), NOT simply threatened preterm labour with a positive partosure or PPROM with no contractions or cervical dilatation.
- A single loading dose should be administered even if immediate delivery is anticipated, unless administration would delay an otherwise urgent delivery.

Counselling and Patient Information for Magnesium Sulphate use for Neuroprotection

- This guideline recommends use of the information provided by the WISH Project which is looking at ways to improve uptake of magnesium sulphate in eligible women.
- Practitioners should be aware that counseling about neonatal prognosis in an emergency situation is often difficult.
- An introduction similar to the following may be helpful:
  "Babies born preterm are at increased risk of developmental problems including cerebral palsy. There is good evidence that magnesium sulphate reduces this risk. Here is an information sheet that explains more." (Appendix One).

Intravenous IV Magnesium Sulphate for Neuroprotection

Single Loading Dose: 5 g magnesium sulphate IV over 20 minutes

- Make up 5 g (2 x 5 ml amps) in 100 ml N-saline (withdraw 10 ml from 100 ml bag first)
- Set up infusion pump
- Run over 20 mins (300 ml per hour)

- There is no evidence to support that an ongoing infusion (maintenance dose) is more effective for neuroprotection than a single loading dose. Therefore at Hauora Tairāwhiti we only administer a loading dose for neuroprotection. Timing of administration should aim to be as close as possible to the birth or within 4 hours.

Observation and Management whilst on Magnesium Sulphate

Magnesium sulphate is excreted by the kidneys and is a smooth muscle relaxant. With normal renal function the recommended loading dose will not cause toxicity and so routine serum magnesium levels are not required. However, close maternal observation is necessary.

Observations and management required:

- Continuous CTG monitoring
- BP, RR, PaO2 and deep tendon reflexes recorded every 15 minutes until stable, then every 30 minutes (See Appendix 2)
- Fluid balance chart

Infusions can be continued at standard rate provided that:

- The knee jerk or biceps reflex are present
- Urine output remains > 25 ml/hour. (NB hourly urine measures are for usual indications, e.g. severe pre-eclampsia, and not required just because of magnesium sulphate administration)
- Respiratory rate does not fall below 12 per minute (if respiratory rate <12 but PaO2 is normal and reflexes present this is unlikely to be caused by magnesium toxicity and more likely to be related to opioid analgesia)
- The emergency trolley should be stationed outside the patients room

Magnesium Sulphate Antidote

If loss of deep tendon reflexes and/or respiratory depression is observed:

1. STOP magnesium infusion.
2. Call Obstetrician urgently.
3. Send blood for urgent magnesium levels.
4. Withdraw 10 mls from 100 ml bag Normal Saline
5. Add 1gram (1x 10 ml ampoule) of Calcium Gluconate to the bag.
6. Set IVAC to run at 300 mls per hour
7. This will deliver 1 gram Calcium Gluconate over 20 mins

Alternatively:

Calcium gluconate can be administered IV.

1. Administer a loading dose of 30 mL of 10% solution via an IV slow push over 5 minutes.
2. Repeat every 10 to 20 minutes up to 4 times, depending on response.

Magnesium Sulphate Levels

Magnesium levels do not require to be measured routinely.

Indications for measuring magnesium levels include:

- Altered renal function (urine output < 25mls/hour, creatinine > 90)
- Signs of toxicity such as drowsiness, loss of deep tendon reflexes, respiratory depression RR < 12 breaths/min
- Unexplained clinical symptoms or signs

Therapeutic levels	1.8 – 3.0 mmol/l
Loss of tendon reflexes	3.5 – 5.0 mmol/l
Respiratory paralysis	5.0 – 6.5 mmol/l
Cardiac arrest	>12.5 mmol/l

Fetal Effects

- Magnesium sulphate crosses the placenta and therefore can reduce the fetal heart variability on the CTG
- Fetal tachycardia may be seen
- At birth the neonate may be hypotensive, hypotonic, hyporeflexic with accompanying respiratory depression.
- **THEREFORE** a Paediatrician must be present at birth

ASSOCIATED DOCUMENTS:

- Inhibition of Preterm labour
- Management of Preterm labour and birth

REFERENCES:

- Doyle LW, Crowther CA, Middleton P, Marret S, Rouse D. Magnesium sulphate for women at risk of preterm birth for neuroprotection of the foetus. Cochrane Database Syst Rev.2009 Jan 21; (1): CD004661. Review.
- Simhan HN & Hhimes KP (2014) Neuroprotective effects of in utero exposure to magnesium sulfate. http://www.uptodate.com/contents/neuroprotective-effects-of-in-utero-exposure-to-magnesium-sulfate?source=machineLearning&search=neuroprotection&selectedTitle=1%7E55&sectionRank=1&anchor=H11#H13
- The Antenatal Magnesium Sulphate for Neuroprotection Guideline Development Panel. Antenatal magnesium sulphate prior to preterm birth for neuroprotection of the foetus, infant and child: National clinical practice guidelines. Adelaide: The University of Adelaide, 2010.
- WISH project (2011) Magnesium Sulphate prior to preterm birth- Improving long term child health. Leaflet available via: http://www.adelaide.edu.au/arch/Consumer_Info-_Mg_Sulphate_Oct_2011.pdf

_____

Authorised By: HOD - Obstetrics

_____

Authorised By: CCM - Women, Child & Youth

Date of Approval: December 2015
Next Review Date: December 2018

APPENDIX 1:

MAGNESIUM SULPHATE PRIOR TO PRETERM BIRTH – IMPROVING LONG TERM CHILD HEALTH

INTRODUCTION:

Pregnancy and childbirth can be a stressful time for some families, especially if your baby is born preterm. Important decisions often need to be made very quickly and it is common to feel overwhelmed.

This pamphlet aims to provide you with information about a new therapy, magnesium sulphate, which may improve your baby's long-term health. This medication has been shown to improve survival free of cerebral palsy in children born very preterm.

This pamphlet summarises the recent National Clinical Practice Guidelines on *Antenatal Magnesium Sulphate Prior to Preterm Birth for Neuroprotection of the Fetus, Infant and Child*, as well as other recent research, so that you can make an informed decision regarding your child's care.

WHAT ARE THE RISKS OF BEING BORN PRETERM?

Preterm birth is quite common – worldwide, the chance of being born before 37 completed weeks is about 10%. In Australia and New Zealand, around 1% of babies are born 'very preterm' (before 30 completed weeks).

Babies can survive outside the womb from 24 weeks, but there is an increased risk of lifelong problems such as visual and hearing impairment, learning difficulties and cerebral palsy. The earlier the child is born, the greater the chance of disability.

WHAT IS CEREBRAL PALSY?

Cerebral palsy is a permanent physical condition that affects the movement and coordination of a child's arms and legs. Some children experience only mild awkwardness of movement, but around one third may suffer severe disabilities including epilepsy (where a child has seizures or 'fits') or be unable to walk or talk.

Cerebral palsy is caused by an injury to the child's developing brain, with almost half of all cases of cerebral palsy occurring in babies born preterm.

Although there is no known cure for cerebral palsy, there is growing evidence that the chance of developing it in the first place can be reduced.

MAGNESIUM SULPHATE – A NEW THERAPY

Magnesium is an element found naturally in the body and it is necessary for the body to function normally.

Magnesium sulphate is a medication that has been widely used in pregnancy for decades. However, in the 1990s, it was discovered that it might also reduce illness in preterm babies.

It is important that new medical treatments are not adopted until there is enough evidence to suggest they are safe and that they really do work.

Recently, enough good quality research has shown that magnesium sulphate offers 'brain protection' to babies born very preterm.

If magnesium sulphate is administered to you shortly before the birth of your very preterm baby, the chance of your baby surviving without disability is significantly increased.

WHAT DO THE GUIDELINES RECOMMEND?

Magnesium sulphate should be used when very preterm birth (less than 30 completed weeks) is planned or expected within 24 hours.

- Magnesium sulphate should be given intravenously (through the mother's veins) and continued until the baby is born (or for 24 hours, if the baby is not born).
- Magnesium sulphate should be given regardless of:
- the number of babies (e.g. singleton, twins, triplets)
- the reason why the birth is occurring
- the number of times the mother has given birth before
- the type of birth (e.g. vaginal birth or caesarean section)
- whether the mother has received antenatal corticosteroid injections

WHEN SHOULD MAGNESIUM SULPHATE BE GIVEN?

- When very preterm birth is planned, magnesium sulphate should be started approximately 4 hours before birth. Magnesium may still provide a benefit even if birth occurs sooner than 4 hours.
- When urgent delivery is necessary however, birth should not be delayed for magnesium sulphate treatment.

WHAT ABOUT IF MY BABY IS BORN AT 30 WEEKS OR MORE?

- The use of magnesium sulphate for babies born preterm, but at 30 weeks or more of pregnancy requires further study before it becomes routine. This research is underway.

COULD MAGNESIUM SULPHATE CAUSE ANY HARM?

Best evidence has shown that when using the recommended doses of magnesium sulphate, there are no harmful effects on the developing baby, infant or child.

Mothers receiving magnesium sulphate may experience some unwanted effects, but they are usually mild and temporary. Reported symptoms include flushing, sweating, nausea/vomiting and headaches. Serious reactions are rare, however magnesium sulphate may affect blood pressure and breathing rate and so women are carefully monitored by the medical team.

WHAT ARE THE BENEFITS OF USING MAGNESIUM FOR MY BABY?

There is now a lot of good quality evidence, based on large studies, to show that magnesium sulphate decreases the risk of cerebral palsy. This is a very important discovery and given the benefits of magnesium sulphate administration before preterm birth, many hospitals and health professionals have started to use this new therapy. The guidelines for use of this treatment, which were developed by an expert panel, were published in 2010. The use of magnesium sulphate and its outcomes is being carefully monitored across Australia.

WHERE CAN WE GO FOR MORE INFORMATION?

- Your doctor and midwife
- Hospitals and community support groups
- The Antenatal Magnesium Sulphate for Neuroprotection Guideline Development Panel. Antenatal magnesium sulphate prior to preterm birth for neuroprotection of the fetus, infant and child: National clinical practice guidelines. Adelaide: The University of Adelaide, 2010
  The guideline can also be accessed from www.nhmrc.gov.au/guidelines/publications/cp128 or ARCH website: www.adelaide.edu.au/arch/
- Cerebral Palsy Alliance www.cerebralpalsy.org.au
- Cerebral Palsy Society of New Zealand www.cpsoc.org.nz/

APPENDIX 2:

CHECKING FOR REFLEXES WHEN TREATING MAGNESIUM SULPHATE

To check this reflex tap the patella tendon which is located just below the patella once, this should cause a sudden extension of the leg, which is known as the knee-jerk. The absence or decrease of this reflex is known as Westphal's sign, which refers to the absence or decrease of patellar reflex or knee jerk. The obstetrician needs to be informed as the Magnesium Sulphate dose may need to be reduced.