NTS Clinical Guideline

Title:	Surfactant administration		
Authored by:	Hammad Khan 2004, Deya Dasgupta 2016	Reviewed date:	02/08/2016
Reviewed by:	Madeline Motsi, Zakiya Dhansey, Angela Goodfellow, Jerry O'Riordan, Kelly Patston, Kate Convery	Next review date:	02/08/2018

Key summary points

- Surfactant administration can benefit infants who have RDS, or who have deficiency or inactivation of surfactant from other underlying disease
- Ensure the ETT is in optimal position (T1-T2) before administering surfactant
- The optimum dose of Curosurf is 200mg/kg
- Monitor ventilator requirements very closely following administration

Indications

1. Lung disease of prematurity

Two strategies exist for surfactant replacement for preterm infants: [1, 3]

- Prophylaxis
  - Surfactant given as soon as possible after birth
  - To infants who
    - need intubation as part of cardiorespiratory stabilisation at delivery [1, 3], **or**
    - are considered at high risk of developing RDS. Consensus is absent for which infants to consider high risk and gestational age thresholds vary across units.
- Rescue
  - Surfactant given as treatment for respiratory failure despite CPAP i.e. increased work of breathing and hypoxia, with: [1, 3]
    - FiO2 ≥ 0.40 on CPAP
    - Features of moderate-to-severe RDS on the chest x-ray
    - Ensure ETT tip T1-T2 before administering
  - Consider repeating the dose
    - From 4 hours after the preceding dose if FiO2 requirement still significant ≥0.30. [1, 2]

2. Indications other than premature lung disease

Consider surfactant for:

- Pulmonary haemorrhage [2]
- Infants needing ventilatory support with [2]
  - Meconium aspiration syndrome
  - Congenital pneumonia
  - Infants of diabetic mothers as this leads to neonatal surfactant deficiency.

3. Repeated doses of surfactant can also be given:

- If the endotracheal tube (ETT) position during the administration of the first dose is found to have been suboptimal
- To top up to 200mg/kg if the initial dose of Curosurf was suboptimal

Storage and administration

1. Curosurf is a refrigerated drug.[4]

2. Warm the vial before using. Avoid shaking the vial. [4]

3. Draw up the Curosurf using a surfactant administration set.

4. If giving prophylactic surfactant, ensure clinical confirmation of ETT position by:
    - Auscultating the chest for equal air entry anteriorly and at the bases.
    - Cross-checking the ETT length with the NeoMate app.

5. Ensure the baby is lying supine with head facing upwards.

6. Instil the Curosurf in a steady bolus, followed by intermittent positive pressure ventilation (IPPV) breaths.

Assessment following administration

Monitor closely for:

- Blockage of the airways
    - Usually occurs during instillation of the large Curosurf fluid volume.
    - Transient bradycardia and desaturation may occur.
    - A higher PIP and FiO2 and manual IPPV may be needed temporarily.[2]

- An increase in lung compliance
    - Can occur rapidly in the minutes following surfactant therapy.
    - Expect to wean the ventilation settings accordingly to avoid over-distension of the lungs, unnecessary barotrauma and hypocapnoea.
    - If the FiO2 is able to be weaned, try to wean the PIP. [2]

Not all infants given surfactant will have a positive response, and the change may not be sustained.

Mechanism of action

Poractant alfa (Curosurf) directly infiltrated to the lungs is used to replace endogenous surfactant.[2]

Endogenous surfactant is a mixture of phospholipids and proteins made by type II pneumocytes in the lungs. By reducing surface tension it reduces alveolar collapse at end-expiration, establishes a functional residual capacity and reduces lung compliance. [2]

Premature lungs are surfactant-deficient because type II pneumocytes differentiate from around 24 weeks' gestation. Adequate surfactant levels occur from 35 weeks onwards. Maternal diabetes in pregnancy induces fetal hyperinsulinism, which suppresses surfactant production. Meconium aspiration syndrome, congenital pneumonia and pulmonary haemorrhage can result in deactivation of endogenous surfactant. [2]

Surfactant replacement in premature infants reduces mortality, air leaks and RDS severity.[1] Meta-analysis of studies comparing prophylaxis to early rescue (i.e. CPAP given from birth and surfactant given for clinical features of RDS appearing within 2 hours of age) suggest reduced incidence of chronic lung disease and mortality from early rescue.[3]

References

1. Sweet DG et al, 'European consensus guidelines on the management of neonatal respiratory distress syndrome in preterm infants 2013 update', Neonatology. 2013;103(4):353-68
2. Greengough A, Dixon AD, 'Pulmonary disease of the newborn' Section 5, Chapter 27 in J.M. Rennie (Ed.) Roberton's textbook of neonatology. 5th edn. Churchill Livingstone, Edinburgh 2012
3. Rojas-Reyes MX, et al, 'Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants' Cochrane Database Syst Rev. 2012 Mar 14;3:CD000510
4. Lindrea KB, Powell C, 'Administering surfactant therapy via an endotracheal tube' Royal Hospital for Women Operating Procedures, Sydney November 2010 at http://bit.ly/20Q6fDY [accessed 29.05.16]