Retrieval Care of the Newborn with Meconium Aspiration Syndrome (MAS)

Disclaimer

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Rationale/Background

- To identify and effectively treat MAS and associated complications

On the Initial Call

- Birth history: Gestational age (The presence of meconium stained amniotic fluid in preterm infants is rare and may be indicative of infection, most commonly Listeria or intestinal obstruction), mode of delivery, Apgar scores, presence of meconium below the vocal cords, resuscitation, HR, RR, SaO2, BP, ABG, FiO2 and BSL.

- Clarification of management: Liberalise oxygen, discuss use of surfactant, inotropes, inhaled Nitric Oxide (iNO) and ventilatory management.

- Locate placenta: It is vitally important that this is examined histopathologically.

Equipment and specific requirements:

- Neonatal drugs including surfactant up to 200mg/kg.
- Consider iNO – hyperlink to iNO policy (requires approval of NETS consultant, receiving consultant and senior nurse on call)
- Consider enrolment in the Neonatal Ultrasound in Transport study

Principles of management:

- Prevention/correction of hypoxaemia & subsequent acidosis through effective oxygenation.
- Oxygen is a potent pulmonary vasodilator, use liberally, DO NOT WEAN during retrieval unless PaO2 above 150mmHg.
- MAS results in secondary PPHN– be prepared!
- Systemic arterial blood pressure should be greater than pulmonary arterial pressure to facilitate blood flow into the lungs. Inotropic support may be necessary and it is often prudent to have inotrope infusion prepared and/or started prior to induction for intubation.
- Intubate and ventilate as required, ensuring adequate induction agents are used.
- Minimal handling/stimulation is paramount, sedation, analgesia and muscle relaxation should be considered.

Assessment and Stabilisation:

Newborn Resuscitation

- Suctioning of the oropharynx and nasopharynx prior to delivery of the shoulders and trunk is unnecessary.
- If the baby is vigorous at birth (heart rate >100bpm, spontaneous respirations, reasonable tone) intubation and tracheal suction is not indicated. Should the baby subsequently develop poor respiratory effort or marked respiratory distress, intubation may be necessary.
- An apnoeic, floppy and/or white baby suggests perinatal hypoxia and acidosis. Visualise vocal cords, observe for signs of thick particulate meconium below cords, intubate prior to initiation of IPPV, attempts at intubation
should not be prolonged, suction via the ETT and meconium aspirator as ETT is withdrawn, use a negative pressure of 80-100mmHg for no longer than 5 seconds.

- Alternatively suction of 80-100mmHg may be delivered below the vocal cords with a 12Fg suction catheter.
- If present at the delivery, collect a cord gas including.
- Remember these newborns are often hypoaemic and you should revert to PPV as quickly as possible and not delay by repeated attempts at suctioning.

**Airway:**
- Most newborns retrieved by NETS for MAS require mechanical ventilation. This would usually be achieved following adequate induction and using an appropriately sized ETT with minimal leak at the larynx.

**Breathing:**
- If not intubated: keep the baby in a high FiO2 to maintain SaO2 > 95%.
- The presence of worsening respiratory distress, labile oxygenation and acidosis indicate the need for respiratory support.
- If intubated: use FiO2 to maintain PaO2 as below, a longer IT & adequate PEEP to facilitate alveolar ventilation.
- Synchrony with the ventilator is essential to prevent air trapping. Consider titrating sedation and analgesia, muscle relaxation and minimise handling.
- Collect an ABG (preferably pre-ductal), target parameters pH 7.35 – 7.45, PaO2 100 – 120mmHg, PaCO2 35 – 45mmHg.
- Apply transcutaneous monitoring and note correlation with ABG, pre-ductal SaO2 indicative of oxygen supply to the brain, a significant difference in pre and post-ductal SaO2 suggests PPHN
- Diagnostic CXR usually reveals patchy opacifications with areas of atelectasis and hyperinflation, be cautious of air leaks, repeat CXR just prior to departure if prolonged stabilisation time.

**Circulation:**
- Use inotropes ± volume up to 20mls/kg of normal saline to maintain systemic pressure and improve cardiac function, monitor mean arterial pressure invasively where possible using UAC or preductal IAL preferably.
- Avoid excessive fluid boluses in view of perinatal hypoxia and lung inflammation.

**Drugs:**
- Target increased cardiac output and systemic blood pressure with dobutamine ± adrenaline and lowering of pulmonary pressure with adequate oxygenation and avoidance of hypercarbia. Discuss iNO with receiving neonatologist and NETS consultant.
- NB: Dopamine may occasionally increase the pulmonary pressures more than the systemic pressure and make the situation worse.
- Meconium inactivates endogenous surfactant. Discuss bolus administration of surfactant with receiving neonatologist. To be effective, it should be given early and repeated at 6 hourly intervals.
- Correct metabolic acidosis, use volume (up to 20mls/kg of normal saline) and inotropes to treat low cardiac output. Some infants may require correction with NaHCO3.
- Collect blood cultures and commence IV penicillin and gentamicin if not done already.

**Environment:**
- Newborns with MAS are usually ineligible for whole body hypothermia as oxygen requirement is typically > 80%.
- Maintain normothermia (avoid iatrogenic hyperthermia), regulate glucose, avoid stimulation - shield eyes, earmuffs, consider muscle relaxation.

**Conference – discussion points:**
- Ventilatory settings and strategies, use of iNO & surfactant.
- Inotropes of choice & titration.
- Analgesia/sedation/muscle relaxation, discuss escalation should it be required en-route.
Once stable on treatment these babies should not be weaned from therapy during retrieval unless the diagnosis is in doubt and the baby is better than at first assessment.

**Enroute:**
Inform captain and co-pilot/flight nurse if sea level cabin is required. Be prepared to:
1. Increase the inotropes
2. Muscle relax the baby
3. Give volume (only if not given earlier)
4. Drain a pneumothorax

**Complications:**
1. Hypoxaemia/PPHN
2. Air leak
3. Pneumonia/chemical pneumonitis
4. Hypoglycaemia
5. Hypotension/ end-organ damage
6. Many newborns with MAS also have hypoxic ischaemic encephalopathy so be observant for evidence of seizures e.g. episodes of hypertension, tachycardia, desaturation with or without abnormal movements.

**REFERENCES:**