HIGH FREQUENCY OSCILLATION

Nursing Management of High Frequency Oscillation (HFO).

Please see the *John Spence Nursery Policies and Procedures* relating to the nursing management of the ventilated infant. This review should include: Intubation & Extubation Procedures, Nursing Management of the Muscle Relaxed Infant and Ventilation Policies.

1. **Indications for High Frequency Oscillation Therapy include:**
   - Failure of conventional ventilation (rescue therapy)
   - Air leak syndrome
   - Persistent Pulmonary Hypertension
   - Extreme Prematurity

2. **Monitoring**
   Infants on HFO require the same monitoring as other critically ill infants - heart rate & rhythm, respiratory rate or effort above ventilation, invasive blood pressure / CVP, TCPaO2 & TCMCO2 and / or saturation. During HFO TCMCO2 monitoring may give valuable information.

   Arterial blood gases are performed frequently and chest x rays are ordered soon after HFO is initiated and frequently at the consultant's discretion.

3. **Surfactant Administration**
   If surfactant is to be administered the mode of ventilation should be switched from HFO to conventional ventilation. This allows for adequate dispersion of the surfactant throughout the lungs.

   **Changing ventilation from HFO to IPPV/ IMV**
   - From the main menu Press “values” and ”set 1” - this will allow you to confirm that the IT; rate, PIP are all within acceptable parameters prior to switching to conventional ventilation.
   - Remember the PEEP will be high as it is representing the MAP on HFO - do not change this parameter protocol.

   **After parameters have been confirmed with registrar / fellow –**
   - Press “ventilation mode” and select “IPPV / IMV”
   - Press “ventilation option” and select ”HFO” press “off”

RPA Newborn Care Clinical Guidelines - March 1999
- The ventilator will alarm and warn you to check PEEP setting
- Use Evita screen / return to main menu and Press "values" and then "set 1" - adjust PEEP to 5cms H₂O
- Assess the infant’s response and administer surfactant as per protocol.

After surfactant has been administered infant should be returned to HFO as soon as possible -
- Press "ventilation mode“ and select “CPAP” press “on”
- Press "ventilation option“ and select "HFO“ and press “on”
- Use Evita screen / return to main menu and Press "values“ and then "set 1“ - adjust PEEP
- Assess the infant’s response and check settings

3. Clinical Assessment of Ventilation
Due to the loss of effective chest ascultation, clinical assessment, ABGs, frequent use of chest x rays and accurate interpretation of monitor data are integral to the early recognition of possible complications in the infant receiving HFO. Do not suction or disconnect infant prior to chest X ray.

Chest Wall Movement (Chest Vibration)
The degree of chest wall movement is a reflection of tidal volume and adequate ventilation.

Chest wall movement is affected by:
- Amplitude changes (dP)
- Changes in lung compliance
- ETT secretions
- Infant's activity level eg asynchronous ventilation

Chest Expansion
The degree of chest expansion is a reflection of lung volume:
Minimal chest expansion is a reflection of lung volume.
Hyperexpansion of the chest may be indicative of either excess lung volumes or air trapping.

Clinical Observation
For non muscle relaxed infants, the rate and depth of respirations, use of acesory muscles degree of respiratory distress and equality of chest movement are to be assessed and documented.
4. Suction
Suction while on HFO requires planning. Do for example suction prior to routine chest x ray or lung recruitment may be adversely affected. The mechanism of HFO which is to establish a constant lung volume is lost if the infant is disconnected while suction is performed.

Frequency of suction is determined by needs of the individual and the underlying disease pathology. Clinical experience from other units suggests that endotracheal suction is not required as frequently as infants on conventional ventilation.

Indications for suction include:
- Reduced chest wall movement
- Increasing FiO2 - failure to maintain TCMO2 / saturation
- Rising TCMCO2
- Restlessness and / coughing
- Increase in spontaneous respiratory efforts
- Ensure medical staff is aware and available for assistance.
See suction Protocol

If the circuit is disconnected and / or the infant's oxygenation does not return to pre suction levels within 5 minutes increase the MAP 2cms H2O above set level for a period of 2-3 minutes. The MAP should then be weaned back to original settings over a period of 5-10 minutes or as condition allows. This allows for re-recruitment of collapsed alveoli.

During post suction period assess and document TCMCO2, changes in oxygen saturation, degree of chest expansion and chest wall movement.

5. Bagging
This will be indicated for:
- Ventilator failure
- Surfactant administration – not routine
- Sudden and catastrophic deterioration in the infant's condition
- Assessment of chest / heart sounds

6. Chest X Rays
Chest x rays need to be taken more frequently while an infant is on HFO
Chest x rays can be taken while infant is on oscillation - see X ray – role of the RN

7. Refilling the Humidifier
These circuits must be refilling chambers or a respiratory transfer set. Circuits should not be broken.

8. Pneumothorax
Pneumothorax may be dramatic in a baby receiving conventional ventilation - it is often an incidental finding in the baby with HFO - see policy pneumothorax

RPA Newborn Care Clinical Guidelines  - March 1999
Signs of Pneumothorax include:
- Subtle deterioration in oxygenation
- Decrease in TCMO2
- Increase in TCMCO2

10. Sedation
From the experiences of other NICUs infants are often more "settled" while on HFO. The nursing literature suggests that there is less need for the routine use of muscle relaxants and narcotics. Each infant needs to be assessed individually.

Nursing Strategies
Assess for possible causes of agitation
Assess need for pain relief or comfort measures - see The JSN Pain Policy

Muscle Relaxation - see Muscle Relaxed Infant
The signs of paralysis wearing off are more subtle in the infant on HFO.
- Reduced chest wall movement due to reduced chest wall compliance
- Obvious respiratory efforts
- Rising TCMCO2 and decreasing TCMO2 / SAO2%
- Rising blood pressure / heart rate
- Body movements / eye fluttering

11. Parental Support - see Muscle Relaxed Infant.
As HFO is a new form of ventilation there will be teaching sessions at the bedside for both medical and nursing staff. This should be as unobtrusive as possible. Parents should not be excluded and should be encouraged and assisted to have contact with their baby. If parents have concerns regarding this new form of ventilation, please ask an appropriate MO to speak with them.