HIGH FLOW NASAL PRONGS

RCH HFNP guideline

DR S RAJAPAKSA

HFNP….

1. What is HFNP?
2. What conditions is it used as therapy?
3. What are the contraindications for use?
4. What are the disadvantages of HFNP?
5. What are the complications?

1. What forms the equipment of HFNP?
2. What do you "prescribe" for a 16kg child needing HFNP?
3. How do you monitor this patient?
4. How do you wean a patient off?

WHAT IS IT?

- Method for providing oxygen and continuous positive airway pressure (CPAP) to children with respiratory distress – exact mechanism is poorly understood
- HFNP may reduce need for NCPAP/intubation, or provide support post extubation
- At high flow of 2 litres per kg per min, using appropriate nasal prongs, a positive distending pressure of 4-8 cmH_2O is achieved
- This improves functional residual capacity thereby reducing work of breathing
- Because flows used are high, heated water humidification is necessary to avoid drying of respiratory secretions and for maintaining nasal cilia function

WHAT CONDITIONS IS IT USED IN PAEDIATRICS?

USES

HFNP are used for the same indications as the traditional method of CPAP using a nasopharyngeal tube:

- Respiratory distress from bronchiolitis, pneumonia, congestive heart failure, asthma etc
- Respiratory support post extubation and mechanical ventilation
- Weaning therapy from mask CPAP or BIPAP
- Respiratory support to children with neuromuscular disease
- Apnoea of prematurity

High flow can be used if there is hypoxaemia ($SpO_2<90\%$) and signs of moderate to severe respiratory distress despite standard flow oxygen.

WHAT ARE THE CONTRAINDICATIONS FOR HFNP?

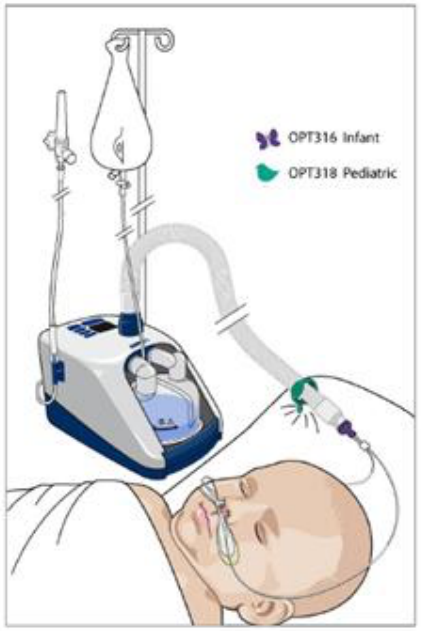
CONTRAINDICATIONS

- Blocked nasal passages/choanal atresia
- Trauma/surgery to nasopharanyx

EQUIPMENT

- Oxygen and air source & Blender
- Flow meter
  - <7Kg use standard 0-15L/min flow meter
  - >7Kg use high flow oxygen flow meter which delivers up to 50L/min flow
- Humidifier (Fisher and Paykel® MR850)
- Circuit tubing to attach to humidifier
  - Children <12.5kg: small volume circuit tubing (RT 329)
  - Children ≥12.5kg: adult oxygen therapy circuit tubing (RT203) and 22mmF oxygen stem connector (Intersurgical 1568)
- Nasal cannula (prongs) to attach to humidifier circuit tubing (size to fit nares comfortably)
  - Newborn: OPT312 Premature or OPT314 Neonatal (maximum flow 8L/min)
  - Infants and children up to 10kg: OPT316 Infant (max flow 20L/min) or up to 12.5kg: OPT318 Paediatric cannula (max flow 25L/min)
  - Children >10kg: Adult cannula size S OPT542, size M OPT544, size L OPT546
- Water bag for humidifier
- Nasogastric tube


Airvo 2


OPT316 Infant
OPT318 Pediatric

STARTING HFNP

3 things to consider

- Flow
- FiO_2
- Humidification

FLOW

- ≤10Kg
  - 2 L per kg per minute
- >10Kg
  - 2 L per kg per minute for the first 10kg + 0.5L/kg/min for each kg above that (max flow 50 L/min)
  - E.g. 16kg= 20L (2 x first 10kg) + 3L (0.5 x 6kg) = 23L/min;
  - E.g.40kg = 20L (2 x first 10kg) + 15L (0.5 x 30kg) = 35L/min
- Start off at 6L/min and increase up to goal flow rate over a few minutes to allow patient to adjust to high flow
- high flow permits constant oxygen delivery even with high inspiratory flows from intense respiration efforts (oxygen dilution reduction)
- nasopharyngeal dead space washout
  - decreases dead space
  - decreases CO_2 rebreathing
  - provides an oxygen reservoir

FIO_2

- Always use a blender, never use flow meter off wall delivering FiO_2 100%
- Start at 50-60% for bronchiolitis and respiratory distress
  - *Lower FiO_2 (e.g. 21% - 25%) may be needed for cyanotic congenital heart disease with balanced circulation*
- Target range for SpO_2 of 94%-98%
  - *75-85% in cyanotic congenital heart disease with balanced circulation*

HUMIDIFICATION

- Because flows used are high, heated water humidification is necessary to **avoid drying of respiratory secretions** and for maintaining **nasal cilia function**
- Set humidifier on 37° C invasive setting (length from temperature probe to nares will result in temperature drop to comfortable level whilst maintaining optimal humidity)

MONITORING

- Monitor patient for response
- Respiratory rate
- Heart rate
- Degree of chest in-drawing
- SpO_2

RESPONSE TO TREATMENT

- Within 2 hours it should be possible to reduce the FiO2 and clinical stabilisation should be seen
- The FiO2 required to maintain SpO2 in the target range (as above) should decrease to <40%
- The heart rate and respiratory rate should reduce by 20%
- Chest in drawing and other signs of respiratory distress should improve
- All infants on high flow should have a nasogastric tube
- Once stable on high flow, the infant should be assessed as to whether they can feed. Some infants can continue to breast feed, but most require feeding via a nasogastric tube
- Regularly aspirate the NG 2-4 hourly for air
- Oral and nasal care must be performed 2-4 hourly

SENIOR HELP IF

- The patient is not stabilising as described above
- The degree of respiratory distress worsens
- Hypoxaemia persists despite high gas flow
- Requirement for >50% oxygen

- If there is rapid deterioration of oxygen saturation or marked increased work of breathing, a chest x-ray should be done to exclude a pneumothorax

What are the disadvantages of HFNP?

What are the disadvantages of HFNP?

- PEEP drops to ~2 cmH20 when the patient's mouth is open
- PEEP is variable and not measurable
- more costly and requires more technology than standard nasal cannula
- critically ill patients may not be perceived as being so sick if they only have nasal cannulae on!

WEANING HFNP – NO/ REDUCED RESPIRATORY DISTRESS/ CVS PARAMETERS

For infants <10Kg

- The first step is to wean the FiO_2 to <40% (usually within the first 1-2 hours, as above)
- Reduce flow to 5 L/min then change to standard low flow 100% oxygen (1 to 2L/min) or cease oxygen therapy if stable

For children >10Kg

- Wean FiO_2 to 40%
- Once the indication for using high flow has resolved, and the patient is stable in 40% oxygen the flow can be weaned to 1-2 L/min with FiO_2 of 100% via standard nasal prong therapy, or oxygen therapy ceased.
- Generally there is no need for a prolonged weaning process, better to be on high flow, standard low flow or off oxygen therapy.

What are the complications of HFNP?

Complications

- Gastric distension
- Pressure areas
- Blocked HFNP due to secretions
- Pneumothorax