ACCU KIT OF THE WEEK

THE ROYAL LONDON HOSPITAL

High Flow Nasal Oxygen Therapy

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What is this?

These are large calibre nasal prongs for use with a flow generator, which delivers flow rates up to 60l/min, an oxygen/air blender, and a humidifier. When used together they allow delivery of high flow nasal oxygen therapy (HFNOT) to patients with acute respiratory failure (ARF).

How does it work?

There are 5 ways that HFNOT works to benefit the patient with ARF. Mnemonic borrowed from Lodeserto and Rettich.

Heat and humidification- reduces airway inflammation (maintains calibre of airways), keeps secretions moist (preventing plugging and preserving mucociliary escalator)

Inspiratory demands- patients with ARF often generate inspiratory flow rates exceeding 100l/min. 15l/min O2 from wall oxygen is not enough

FRC is increased- PEEP is generated (to varying degrees up to 6cmH20) This depends on mouth-opening, body habitus and flow rate. There is experimental evidence that HFNOT increases end-expiratory lung volume. It may also increase intrathoracic pressure slightly which reduces preload- useful in acute LV failure induced pulmonary oedema.

Less restrictive- heat and humidification increase comfort compared to dry cold gases. Nasal delivery avoids use of tight-fitting masks, allowing oral intake, communication and reducing pressure damage to skin

Oxygen Dilution- When a patient with ARF is breathing hard, they can generate high PIFRs (up to 120l/min). When wearing a hudson mask with 15l wall oxygen, the additional gas flow contribution comes from room air. This means that the inspired oxygen fraction will be much closer to 21% than 100%. Increasing the oxygen flow rate with HFNOT will reduce oxygen dilution

Washout of dead space- this is probably the most valuable effect- when we breathe out, we fill our trachea and pharynx with breath that is low in O2 and high in CO2. This is about 150ml. When you next breathe in, this gas goes to the alveoli first. If you are sick with small tidal volumes, this polluted air makes up a larger proportion of each breath. This impairs gas exchange by reducing the gradient of both O2 and CO2 across the alveolar membrane. HFNOT washes out the pharynx, filling this dead-space with oxygen-rich air, improving oxygenation and, potentially, hypercapnoea. In turn, work of breathing can also be reduced.

What are its uses?

Acute hypoxaemic respiratory failure in alert, spontaneously ventilating patients who can protect their own airway. Possible use in hypercapnoeic respiratory failure (see above).

Common pathologies where we see it effectively employed (amongst others):
Pneumonia
Pneumonitis (e.g. Covid-19)
Pulmonary oedema
Acute Asthma (with caution in critical care area)

Useful in selected patients post extubation
Useful for pre-oxygenation and in apnoeic oxygenation during RSI (not in Covid-19!)

What are the risks?

Without close monitoring from experienced clinicians, HFNOT risks delaying decisions to intubate.
Classified as an aerosol generating procedure (increases risk of Covid-19 transmission)
Uses lots of oxygen!
Not suitable if the nasopharynx is obstructed or for post-op nasal/pharyngeal/BOS patients- risks pneumocephalus. Obviously not a good idea with recent or current epistaxis.
Controversial post-op UGI surgery (PEEP effect could theoretically damage anastomosis).