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Adapted by Dr A Norman March 2016

The Manujet and Ravussin Needle

A High Pressure Ventilation System

There have been some changes in the management of the Can't Intubate Can't Oxygenate scenario.

The "Can't Intubate, Can't Oxygenate" (CICO) scenario is a rare event with an estimated incidence of approximately 1:10000-1:50000 anaesthetics but may be more frequent in other specialties such as ICU or ED due to the patient case mix (*NAP4 Sec2 Ch13*). Although CICO is 'rare' over half of experienced anaesthetists report encountering this demanding scenario at least once in their career. It is therefore crucial to be as prepared as possible for such an eventuality.

Narrow bore cricothyroidotomy has been removed from the adult DAS guidelines as of November 2015. However, there are still 2 points in our Trust that a Manujet may need to be considered.

1. Paediatric CICO with needle cricothyroidotomy using a Ravussin Needle.
2. Connection to a rigid bronchoscope.

Clear communication is a vital part of successful CICO procedure, both in communicating to the theatre team that a CICO event has arisen, and in achieving the correct series of steps necessary for a good outcome.

Small cannula techniques (2-3 mm) plus a high-pressure gas source.

These techniques rely on a patent airway for exhalation. However, inability to inflate the lungs with positive pressure ventilation via a facemask does not mean that the airway will be obstructed in expiration, when positive intraluminal pressure tends to expand and open the upper airway. In one series, 86% of patients with CICV retained a patent expiratory route. Gas entrainment is also a feature of these techniques if the upper airway is not obstructed

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Small cannula technique (needle cricothyroidotomy)

1. Attach the Ravussin intravenous cannula to a 5 ml syringe, ideally filled with 2 ml saline.
2. Place the patient in a supine position.
3. If there is time and no risk of cervical spine injury, extend the neck, perhaps with a sandbag under the shoulders. As a minimum, remove pillow. Can also slide patient up the bed to let head hang over edge.
4. Identify the cricothyroid membrane by palpation between the thyroid and cricoid cartilages. Failing this – palpate trachea. Worst case - midline. Consider UltraSound if IMMEDIATELY available in anaesthetic room.
5. Ideally prepare the neck with antiseptic swabs.
6. Place a hand on the neck to identify and stabilise the cricothyroid membrane, and to protect the lateral vascular structures from injury from the needle.
7. Insert the needle and cannula through the cricothyroid membrane at a 45-degree angle caudally, aspirating as the needle is advanced. May need to move toward perpendicular in a thick neck.
8. When air is aspirated, stabilise hub of cannula with non-dominant hand, grip needle with dominant hand and advance the cannula over the needle, being careful not to damage the posterior tracheal wall. Remove the needle.
9. Re-check that air can be aspirated via the cannula through the saline. Failure to achieve this may be due to kinking of the cannula, try withdrawing slightly to see if this is corrected.
10. Holding on to the cannula securely, connect to Manujet injector. Never let go of the cannula!

Notes

- Exhalation relies on the passive escape of gas and therefore the absence of complete supraglottic airway obstruction. This may be facilitated by inserting a laryngeal mask airway.
- The Manujet™ / Sanders injector, a wall oxygen supply or an oxygen cylinder are the *only* ways of ventilating through a small cannula. Ventilation is *not possible* via the common gas outlet of an anaesthetic machine, or some oxygen meters on the side of anaesthetic machines, which are limited by 40 kPa pressure valves

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A Ravussin Needle. This is the adult version. The Manujet box contains two other sizes, infant and child. A decision on which one to use will depend on patient size.

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Manujet

1. Attach gas hose of Manujet to Schrader valve of cylinder, wall outlet, anaesthetic machine (machines, cylinders may have mini Schrader valve – ensure correct for Manujet).
2. Pull out the dial on the side of the Manujet to adjust the jetting pressure then push in to confirm setting

3. The Manujet set at 1.0 - 1.5 bar (i.e. Infant setting, in the Yellow Zone) delivers inspiratory flow of approx 300 mls/second through a 14G cannula.

4. Connect a wide bore IV extension line (found with the Manujet at WRH) to the Luer connectors of the Manujet and the Cricothyroid cannula.
5. Squeeze handle to deliver high pressure jet flow. An initial breath of 3-4 seconds (900-1200ml) may not only oxygenate alveoli but also recruit collapsed alveoli. **NB: Whilst applying the jet ventilator, signs of flow must be sought by checking the chest for movement.**
6. Observe for chest falling. Airway manoeuvres/adjuncts/LMA may help. Disconnecting Manujet from cannula allows some slow expiration. Expiration guards against lung hyperinflation, barotrauma, reduced venous return due to high intra-thoracic pressure. Note: you are aiming to achieve emergency oxygenation, not necessarily normal ventilation and CO_2 removal. Expiratory pathway may be patent even when inspiratory pathway is blocked on positive pressure facemask ventilation.
7. If adequate expiration is not present, wait until O2 saturations start to drop after (hopefully!) initial rise before delivering next 1-2 sec breath.
8. Decide on further airway management – conversion via Seldinger technique to large cannula, formal Tracheostomy, further attempts at ETT placement utilising different equipment/personnel.