

Major Trauma: Emergency Surgical Airway - Paediatric

IMPORTANT: The skills required to perform an emergency surgical airway cannot be acquired by reading a guideline. It is a time critical & high risk intervention that should be performed by the most experienced individual available.

PRINCIPLES

1. Plan in advance
2. Ensure all necessary equipment is available in one place and that staff know where to find it in an emergency.
3. Anticipate when an emergency surgical airway may be necessary and ensure your team is briefed and equipment is to hand.
4. Recognise that any attempt at intubation may lead to a 'can't intubate, can't ventilate' (CICV) scenario requiring surgical intervention.
5. Once the need for a surgical airway is identified act swiftly and do not be distracted by prolonged attempts to intubate.
6. All those who may be called upon in the event of a CICV scenario should make themselves aware of the nature, location and functional use of locally available equipment.
7. Teams and individuals that may be called upon in the event of a CICV scenario should make full use of training and CPD to best equip them in this rare event (eg through multi-disciplinary practice of simulated scenarios).

Background Information

There is a limited evidence base for the use of any trans-tracheal technique in infants and children, mainly animal and manikin studies. In children these techniques have a poor success rate and are linked to a very high incidence of complications particularly in infants (incorrect position of airway device, barotrauma, oesophageal perforation). They should only be attempted as life-saving manoeuvres.

The unique anatomy of the infant larynx, the small size of the cricothyroid membrane, and the technical difficulty of locating the correct anatomical structures make the use of most of the marketed devices impractical in children. Marketed devices (eg Ravussin[®], Quicktrach[®]) might possibly be used in children older than 8 years of age.

The infant's larynx is more anterior and higher in the neck (C2-C3) compared to adult's (C4-C5), and the cricothyroid membrane is directly under the mandible and has a different orientation, all of this making the needle insertion at 45° impossible and damage to the larynx more likely.

Moreover in neonates the gap between the cricoid and the thyroid cartilage is < 2.0-mm. In neonates and infants a trans-tracheal approach might possibly be a safer procedure. However, the trachea is even more compressible and smaller in diameter at its lower level, significant compression and full collapse is seen during insertion of the cannula, making the perforation of the posterior wall and false passage formation during needle insertion even more likely. Many publications have questioned the role of cannula techniques in

emergency airway management in children and perhaps a surgical approach should be attempted earlier.

Cannula (cricothyroidotomy/transtracheal) approach

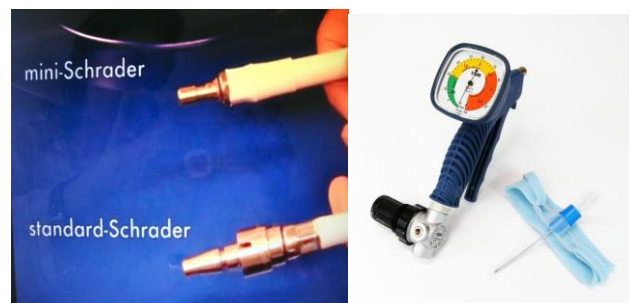
If a cannula cricothyroidotomy/transtracheal approach is going to be attempted use a kink-resistant cannula – “Ravussin catheter”

16 g – babies & infants
14 g – children
13 g - adult

The Ravussin cannula can be connected to: a) Manujet III via luer-lock connector
b) Bag-ventilation via 15mm connector

Jet Ventilation

- High-pressure oxygen device source
- If available use the Manujet III, which allows adjustment of the driving pressure between 0 and 400 kPa. The injector should be initially set to the lowest possible delivery pressure and then up-titrated slowly to achieve adequate chest expansion
- Make sure of upper airway patency to allow passive expiration.
- Make sure to assure enough time for full passive expiration
- Transtracheal jet is a temporary measure and must be accompanied by an action plan progressing to a definitive airway



The Manujet III can be connected to an oxygen source supply by two different ways:

1. “Mini-Schrader” to connect to the back of the anaesthetic machine
2. “Standard-Schrader” to connect to O₂ cylinder and O₂ wall supply

Surgical cricothyroidotomy / tracheotomy

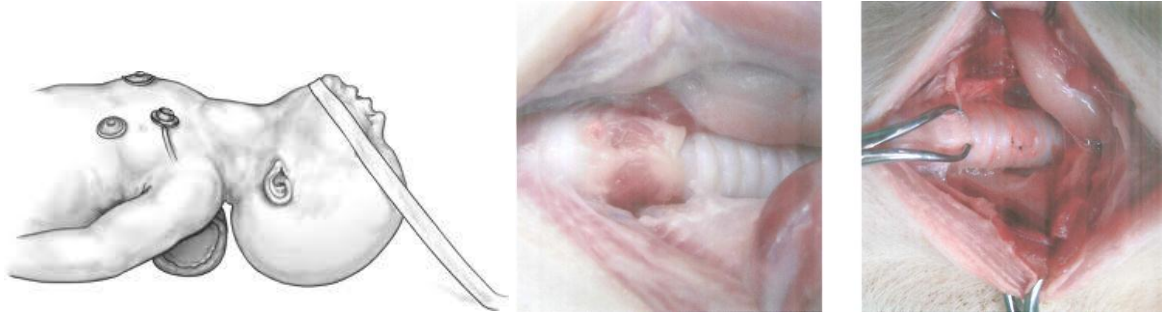
Surgical cricothyroidotomy and emergency tracheotomy are more likely to be successful than needle cricothyroidotomy.

In neonates and infants a trans-tracheal (rather than cricothyroid) approach may be a safer procedure.

A “Paediatric surgical tracheotomy emergency set” (including scalpel, sharp tip scissors and 3 towel forceps) should be used in conjunction with a paediatric bougie and ETT



1. Position: the neck is extended, soft tissues pulled up and away (note that whilst extension of the neck should in general be avoided in trauma it is likely to be necessary to successfully perform this life-saving intervention).
2. Palpate and identify the trachea fixing it between thumb and index finger
3. Perform a vertical incision through the skin & subcutaneous tissue – stay in the midline!
4. Palpate and identify the trachea (bleeding makes visual identification of the trachea more difficult)
5. Make a horizontal incision in the trachea using the scissors
6. Using a towel clip lift the trachea anteriorly in order not to damage the posterior wall
7. Insert a neonatal bougie
8. Small paediatric ETT over the bougie
9. Withdraw bougie / hold & fix paediatric ETT in position
10. Connect to ventilation circuit



ONCE THE AIRWAY IS SECURED

Adequate sedation/paralysis/analgesia should be provided

Any equipment necessary to re-intubate the patient should be available, particularly during patient transport.

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