PREAMBLE

Intubation in pediatric trauma patients must be done with care to prevent hypotension and hypoxemia. Accordingly, care should be taken in preparation (of the patient, of medications, and of equipment) and execution.

PREPARATION

Assessment:
The patient should be adequately assessed before and during intubation (airway examination, breathing examination).

Positioning:
The patient should be kept in NEUTRAL head position. The cervical spine collar should be removed during the intubation procedure, while maintaining manual in-line cervical spine precautions.

Monitoring Equipment:
The patient should be monitored with pulse oximetry, capnography, non-invasive blood pressure monitoring (either automated or manual) and a cardiac monitor.

Airway Equipment:
- A cuffed ETT is recommended in Pediatric Trauma patients (including burns). The estimate for the tube size is: (age in years/4) + 4. This formula yields the inside diameter of the tube in mm. A Microcuff brand endotracheal tube (Kimberley-Clark) is recommended.
- Satin-slip stylet by Mallinckrodt (recommended)
- Rigid suction system (Yankauer)
- Pediatric Laryngoscope - the Pediatric Advanced Life Support checklist describes recommended laryngoscope sizes for patient age. Miller laryngoscope blades/Robertshaw laryngoscope blades (preferably fibreoptic) recommended.
- Semi-rigid stylet (for endotracheal tube), lubricated with any water based lubricating jelly. Satin-slip stylet by Mallinckrodt is recommended.

PRE-TREATMENT

Pre-Oxygenation: Prior to every intubation attempt, the patient should be maintained with oxygen via nasal prongs (6 litres per minute at all pediatric ages), in addition to 100% oxygen via bag-valve-mask (tight anatomical seal). This should be maintained while preparing equipment and medications. If the face mask seal is impaired by the nasal prongs, remove the nasal prongs and optimize bag mask ventilation/oxygenation. Ventilation should be supported if the patient is apneic or hypoventilating while preparing for intubation.

Fluids: Ensure simultaneous effort to support intra-vascular volume using either an isotonic crystalloid solution or blood product depending on the clinical situation.

MEDICATIONS

If the weight is not immediately known or easily estimated, a Broselow tape can be used for the purpose of drug dosages (as well as ET tube sizing). Weight can also be estimated using the following formula: (age in years x 3) + 7
- Ketamine 1-2 mg/kg (lower end of dose range if hypotension/hypovolemia concern, otherwise higher end of dose range)
- Rocuronium - 1 mg/kg
• Vasopressors: Hypotension adversely affects outcome of children with traumatic brain injury. Hypovolemia and positive pressure ventilation may result in hypotension during the intubation procedure. If the patient is unstable at induction, anticipate problems and have a vasopressor available in case of further instability following the administration of anesthetic and institution of positive pressure ventilation.

INTUBATION/FOLLOW-UP

Oral intubation is preferred. Tracheal intubation should be immediately confirmed with capnography. Secure the endotracheal tube. Obtain chest x-ray (to ensure tube is not in a mainstem bronchus). Recheck blood pressure and pupils.

If intubation is unsuccessful on the first attempt, gentle bag mask ventilation with 100% oxygen should be initiated while preparing for the second attempt.

Goals of ventilation should be normocarbia (ETCO$_2$ 35-40 mmHg) and arterial saturations >92%. Usual starting tidal volume would be 7-8 mLs/kg, rate determined by age, positive end expiratory pressure (PEEP) 5 cm H$_2$O. An arterial blood gas is recommended to confirm ventilation and oxygenation. A venous gas from a non-tourniquet vessel can be used if arterial access is not available.

POST-INTUBATION MANAGEMENT

On-going sedation (morphine 40 micrograms/kg/hour and midazolam 100-200 micrograms/kg/hour) and consider ongoing paralytic medications (rocuronium – increments of 0.6 mg/kg)

FOOTNOTES/REFERENCES

• Ketamine is our preferred agent for intubation of children, with or without Traumatic Brain Injury (TBI). Ketamine has been shown in children with TBI to reduce ICP. We discourage the use of etomidate because of concern of adrenal suppression.


• The use of atropine is generally unnecessary and does not prevent bradycardia in children. Ensuring good oxygenation is the best approach to avoiding bradycardia.


• The use of lidocaine is of no benefit and may be harmful as pre-treatment for head injured patients because of its potential of blocking sympathetic responses.


• The use of cricoid pressure during intubation has been shown to increase the difficulty of intubation when applied incorrectly and does not prevent aspiration of gastric contents. If a practitioner chooses to use cricoid pressure, it should be released if there is poor visualization of the glottis. External laryngeal manipulation may improve glottic visualization.


Tube sizing and drug dosages are available in many references, including: Gregory’s Pediatric...

Broselow tapes are available from Armstrong Medical (575 Knightsbridge Parkway, P.O. Box 700, Lincolnshire, IL 60069-0700, 1-800-323-4220)