

Percutaneous Tracheostomy

Overview:

Airway management in the intensive care unit is highly based on clinical assessment. Patients with prolonged mechanical ventilation and endotracheal intubation are at risk for developing complications such as pneumonia, tracheomalacia, subglottic stenosis. Tracheostomy has been shown to be an excellent option for prolonged airway management, minimizing these complications while providing greater patient comfort and oral hygiene. Bedside percutaneous tracheostomy has been shown to be a safe alternative to open tracheostomy in the operating room, and it obviates patient transport and anesthesia/OR costs.

The protocol in the trauma ICU at VUMC is to perform a modified percutaneous tracheostomy at the bedside with assistance of procedure support personnel. While the most common complication of percutaneous tracheostomy is airway loss, by following the protocol below the incidence of this complication has been held to well under 1% (2 lost Airways/>3000 tracheostomies).

Purpose:

- **To define the indications and contraindications for tracheostomy**
- **To describe the accepted safe protocol for the performance of a bedside percutaneous tracheostomy**

1. Recommended indications for percutaneous tracheostomy
 - a. Presence of pathologic conditions resulting in prolonged (>7 days) mechanical ventilation
 - b. inability to protect airway (e.g. altered mental status, anatomical, deconditioning)
 - c. high-risk airway
 - i. external cervical immobilization (e.g. Halo)
 - ii. need for definitive airway and inability to intubate
 - iii. anatomical considerations
 1. Unresolving airway edema
 2. Facial fractures
 3. Mandibulomaxillary fixation
 4. Cervical spinal cord injury
 - d. consider early (<7 days) for predicted prolonged mechanical ventilation
 - i. Severe TBI
 - ii. Cervical spinal cord injury \leq C5
 - iii. TBI + submaxillary facial fractures
 - iv. Laryngotracheal injury
2. Recommended contraindications for elective bedside tracheostomy
 - a. < 7 days postoperative from anterior cervical ORIF
 - b. High ventilator settings
 - i. FiO₂ >50%
 - ii. PEEP > 10
 - iii. intolerant of volume control mode (e.g. APRV/BiVENT, VDR)
 - c. Elevated intracranial pressure

- d. Hemodynamic instability
- e. Predicted early mortality

3. Bedside tracheostomy considerations

- a. follow protocol for sterile precautions, informed consent, sedation, and preoperative timeout as per bedside surgery protocol
- b. High risk patients must be identified pre-procedure.
 - i. Morbid obesity
 - ii. airway edema
 - iii. cervical trauma
 - iv. extremes of age
 - v. other considerations
 - 1. Mandibulomaxillary fixation
 - 2. Halo brace
 - 3. High ventilator settings
 - a. FIO₂ >50%
 - b. PEEP >10
 - c. intolerant of volume control mode (e.g. APRV/BiVENT, VDR)
 - 4. bleeding diathesis
 - 5. anatomical considerations
 - vi. Covid-19 Patients
 - 1. 21 days from 1st positive test
 - 2. PEEP <12
 - 3. FiO₂ <80%
 - 4. Must be performed by the attending
- c. Consideration should be given to bronchoscopy guidance versus conversion to open procedure either at bedside or in the operating room if unable to successfully place in modified percutaneous technique
- d. Proximal XLT tracheostomy should be selected for patients with significant anatomic concern or BMI ≥ 35
- e. Withdrawal of endotracheal tube must be performed by experienced personnel with care to avoid inadvertent extubation.

4. Supply and instrument set up

- i. percutaneous tracheostomy trauma car to include
 - 1. Ciaglia percutaneous tracheostomy kit
 - 2. One pair mayo scissors
 - 3. Three pair of curved hemostats
 - 4. Two needle-holders
 - 5. two Army-Navy retractors
 - 6. tracheostomy tubes (usually #8 Shiley, with appropriate back-up sizes)
 - 7. sterile towels, gowns, and gloves
 - 8. skin prep solution (chlorhexidine)
 - 9. two 2-0 silk or monofilament suture
 - 10. intubation set with difficult airway bag
 - 11. CO₂ detector
 - 12. Two towel clamps

5. Procedure

- i. induction of IV general anesthesia
 1. see bedside surgery protocol
 2. recommend chemical paralysis in addition to analgesics/anxiolytic
- ii. surgical set up as per bedside surgery protocol
- iii. preoperative timeout
- iv. surgical procedure
 1. skin infiltrated with lidocaine/epinephrine
 2. vertical incision made one fingerbreadth above sternal notch
 3. blunt dissection carried down to the level of the trachea in the midline between the strap muscles
 4. endotracheal tube tape is cut and procedure RN at the head of the bed manipulates the ET tube while the surgeon palpates for its presence within the trachea. Tidal volume should be closely monitored during this time. The tube is slowly withdrawn until the balloon could be palpated in the subglottic position. The balloon is deflated, and the tip of the endotracheal tube is withdrawn to the level of the cricoid cartilage under manual guidance.
 5. The percutaneous tracheostomy is completed in the standard fashion using a needle or needle/catheter system to gain access to the trachea, verified by air return.
- v. Confirmation of position
 1. CO2 monitor is connected to the tracheostomy tube and color change as well as expiratory tidal volumes are confirmed.
 2. Once the tracheostomy secured, the endotracheal tube may be fully withdrawn.
 3. Tracheostomy secured with suture and neck strap.
- vi. Post procedure chest x-ray is required.

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