Tracheostomy

Historical Background

- Tracheostomy is a procedure where a conduit is created between the skin and trachea.[1]
- Placement of a tracheostomy tube is one of the earliest recorded surgical procedures dating back to 100 BC.[2]
- The first documented successful tracheostomy was performed in 1546 by Italian physician, Antonio Musa Brasavola.[2]
- In 1909, surgeon Chevalier Jackson described a surgical tracheostomy (ST) technique that is still employed today.[2-3]
- Ciaglia first described the percutaneous approach in 1985 by using serial dilators with modification of the Seldinger guidewire technique for insertion.[2-5]
- Variations of Ciaglia's original method, including the use of bronchoscopic-guided percutaneous dilatational tracheostomy (PDT), has made this technique a viable alternative to ST.[4-6]
- Tracheostomy is now one of the most frequent procedures undertaken in critically ill patients.[2,4,6-7]
- Approximately 10% of critical care patients in the United States require a tracheostomy annually, primarily due to the need for prolonged mechanical ventilation.[1-3,7]

Benefits

- Tracheostomy offers many advantages over conventional endotracheal intubation.
    - Improves patient comfort and reduces sedation requirements allowing for early mobilization, resumption of oral nutrition, return to speech, and administration of nursing care.[2-3,7-8]
    - Reduces airway resistance, allowing for less work of breathing and respiratory fatigue.[3,7-8]
    - Transtracheal pulmonary toilet reduces the risk of nosocomial pneumonia.[2,7]
    - May expedite weaning from mechanical ventilation and decrease the length of hospital stay.[7-8]
    - Minimizes the risk of laryngotracheal injury from prolonged intubation, including pressure ulcers, stenosis, malacia, and vocal fold dysfunction.[2-3,7-8]

Indications and Contraindications

- Indications [1-3,8]
    - Prolonged mechanical ventilation for respiratory failure
    - Pulmonary toilet
    - Airway protection
    - Upper respiratory tract obstruction
    - Prophylaxis
- Contraindications [1-4]
    - There are no absolute contraindications to performing a ST.
    - PDT is usually contraindicated for emergent airway compromise, pediatrics (<16-years-old), tracheomalacia, anatomic anomalies (abnormal or poorly palpable neck anatomy), morbid obesity, neck infection/burn/trauma, cervical spine instability, uncorrectable bleeding diathesis, and/or significant ventilation requirements.

Treatment Method

- Choice of Method
    - Optimal technique is a topic of debate.
    - Traditional open tracheostomy is commonly performed in an operating room or, in some instances, at the bedside.
    - The percutaneous approach is typically performed at the bedside utilizing bronchoscopic-guidance in the critical care setting.[4-6]
    - Despite numerous studies comparing ST versus PDT, there remains no consensus on which method is superior.[5]
    - Both modalities appear to be safe with comparable complication profiles when performed by experienced practitioners under controlled circumstances.[3-4,6]
    - The choice of approach should be made on a case-by-case basis taking into account patient factors, operator and institution experience, and availability of resources.[2-3]
- Timing
    - There is no consensus on when to convert an intubation to a tracheostomy.[2-3,7,9]
    - Early tracheostomy (early: ≤10 days versus late: >10 days postintubation) shows consistent morbidity benefits but not mortality benefits.[2,7-8]

- It is generally acceptable to wait 7-10 days in most critically ill patients to determine if ongoing respiratory support will be needed.[7-9]
- The following patient groups may benefit from early tracheostomy: [2-3,7,9]
    - Significant pulmonary disease (i.e. COPD, ARDS, failed primary extubation)
    - Respiratory failure after cardiovascular surgery
    - Neurological conditions (i.e. stroke, traumatic brain injury, spinal cord injury, neuromuscular disorder)
    - Polytrauma involving the head, neck, spine, and/or chest
    - Severe burns (>60% total surface body area) requiring multiple operative procedures
    - Head/neck burns with associated inhalation injury

Management of Complications

- Successful management of complications relies upon early recognition. [1-2,4-6,8,10-11]
- Intraprocedural (during or immediately after insertion)
    - Airway fire
    - Multiple attempts
    - Paratracheal insertion
    - Posterior tracheal wall injury
- Early Postprocedural (≤1 week)
    - Hemorrhage
    - Subcutaneous emphysema
    - Pneumothorax
    - Stomal infection
    - Loss of airway
- Late Postprocedural (>1 week)
    - Granulation tissue formation
    - Stenosis (subglottic, tracheal)
    - Tracheomalacia
    - Fistula
    - Scarring
    - Vocal fold dysfunction

- Subjective phonetic changes
- Subjective respiratory symptoms

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