**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.\(^2\)\(^,\)\(^4\)\(^-\)\(^7\)
- 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

- Prolonged mechanical ventilation for respiratory failure
- Pulmonary toilet
- Airway protection
- Upper respiratory tract obstruction
- Prophylaxis

Contraindications

- 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.
- Despite numerous studies comparing ST versus PDT, there remains no consensus on which method is superior.
- Both modalities appear to be safe with comparable complication profiles when performed by experienced practitioners under controlled circumstances.
- 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.

Timing

- There is no consensus on when to convert an intubation to a tracheostomy.
- Early tracheostomy (early: <10 days versus late: >10 days postintubation) shows consistent morbidity benefits but not mortality benefits.
• 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

References


