The Outpatient Care of a Child with a Tracheostomy

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Disclosures

• The authors have documented that they have no financial relationships to disclose or Conflicts of Interest (COIs) to resolve.

Learning Objectives

• Describe conditions in children that warrant a tracheostomy
• Discuss transition to home for a child with a new tracheostomy
• Cite standard of care management of a child with a tracheostomy
• Apply evidence-based principles in the treatment of tracheitis
• Identify acute and emergent care of a child with a tracheostomy

What is a tracheostomy?

• A temporary or long-term surgically placed opening in trachea
• Associated with significant morbidity and mortality
  Watters et al. demonstrated 38.8% hospital admissions 8.9% mortality (2016)
  De Jesus Rojas et al. found:
  21/36% hospital admission in first 30 days comparing results of two clinics
  3.4/35.7% mortality (2018)
  Average age to decannulation: 32/29 months
• Very costly: $53.3 million in first 2 years (Watters, 2016)

Decision to Place a Tracheostomy

• Overall Prognosis of child
  – Comorbidities
  – Neurologic impact on child
• Level of Family Support
• Ethical Responsibilities
• Short term or long term?

Basic Anatomy and Physiology of the Upper Airway

• Nose: humidifies and filters air
• Larynx: Cartilage that protects vocal cords, assists with swallow
• Vocal Cords: as air passes through, vibrate and sound created. Also protects against aspiration
Basic Anatomy and Physiology of the Lower Airway

- Trachea: open tube of airway
- Bronchi: 2 branches that separate off from trachea
- Lungs: location of bronchioles, alveoli where gas exchange occurs
- Tracheostomy: surgical incision in tracheal ring to form an opening

Underlying Conditions that result in Tracheostomy Placement in Pediatrics

- Congenital defects/bypass upper airway
  - Laryngeal stenosis, tracheal stenosis
- Severe prematurity with Bronchopulmonary Dysplasia (BPD)
- Need for long term ventilation with chronic respiratory failure/insufficiency

Tracheostomy Tubes

- 
  
  Shiley: Conventional hard plastic, can go through MRI
- 
  
  Bivona: soft silicone, customizable
- Cuff vs Un-cuffed
  - Cuff reduces risk of aspiration, used for high pressure requirements
- 
  
  Fenestrated vs non-fenestrated
- Single or double cannula
- Metal rarely seen in pediatrics

Tracheostomy Custom Order Form
**Trach - Specifications**
Traches vary in diameter, length, flexibility, composition

- **ID**: diameter of the inside of the trach tube
- **OD**: diameter of the outside of the trach tube; does not include the cuff diameter
- **Length**: length of the shaft of the trach
- **TTS**: tight to shaft
- **FlexTend**: permanent flexible tube extension

**Tracheostomy Tube Accessories**

- **HME**: Heat Moisture Exchange
- **PMV**: Passy Muir Valve
- **Cap**: Trach when preparing to decannulate

**Transition to home**

- Extensive standardized training
  - Has been shown to decrease readmissions (Gaudreau et al)
- “Care by Parent” with at least 2 providers
- List of necessary medical supplies
- Private duty nursing

**Transition to home**

- Follow up phone call
  - Home visit?
- Follow up appointment with PCP
- Follow up appointment with ENT
- Follow up appointment with Pulmonary

**Medical Equipment for Trach**

- Back up and size down
- Trach care kits
- Suction catheters
- Suction Machine
- Ambu Bag

- Trach care kits
- Split gauze
- Saline
- HME/PMV/Cap
- +/- Ventilator

**Daily Care of Trach**

- Assess patient, respiratory status
- ENSURE ALWAYS HAVE BACK UP AND SIZE DOWN
- Clean Site:
  - with normal saline and/or hydrogen peroxide QD and prn
  - “2 PROVIDERS”
- Monitor stoma site
  - Erythema, discharge, granuloma, odor
- Check trach ties: multiple times per day
  - Only ONE finger tip
Daily Care of Trach (cont.)

- Airway clearance: Albuterol and/or saline (0.9 or 3%) nebulized as prescribed typically 1-3 times a day and prn
- CPT:
  - Manual or with VST/IV
- Suction: Required throughout day to maintain patency
  - Suction the length of the tracheostomy tube plus 0.5 cm
  - Saline or sterile water
- Monitor secretions
  - Color, consistency, odor

Humidification

- HME
  - ‘Artificial nose’ that uses the patient’s own breath
  - Change daily and prn (thick secretions, soiled)
  - Oxygen prn with ‘hood’
- Trach collar
  - Can use cool or heated mist
  - Oxygen prn

Complications after Tracheostomy

- Early Complications
  - Intraoperative and up to the first trach change
- Late Complications
  - Following the first trach tube change

Complications cont.

- Early Complications
  - Cannula obstruction
  - Local irritation and infection
  - Bleeding
  - Accidental decannulation
  - False passage formation
  - Tracheal innominate fistula and hemorrhage
  - Death

- Late Complications
  - Cannula obstruction
  - Recurrent tracheitis
  - Bleeding
  - Accidental decannulation
  - Tracheal stenosis
  - Tracheal granuloma
  - Tracheomalacia
  - Aspiration
  - Tracheoesophageal fistula
  - Tracheal innominate fistula and hemorrhage
  - Death

Complications cont.

- Late Complications
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  - Death

Cannula Obstruction

- Etiology:
  - Thick secretions or mucus plugs most common cause
  - Bleeding
- Signs/Symptoms
  - Increased respiratory rate
  - Increased work of breathing (retractions, nasal flaring)
  - Increased heart rate
  - Decreased oxygen saturation
- Management
  - Suction
  - Bag
  - Change trach
- Prevention
  - Suction as needed
  - Humidification
Stoma Irritation and Infection

- Localized to stoma site
- Etiology
  - Friction, pressure, moisture, secretions, bacteria, yeast
- Signs/Symptoms
  - Edema
  - Erythema
  - Odor
  - Drainage
  - Skin breakdown
  - Pain with manipulation of trach

Management
- Dependent upon etiology
  - Topical Steroids
    - Hydrocortisone Oint/Creme 0.5%, 1%, 2.5%
    - Triamcinolone Oint/Creme 0.025%, 0.1%, 0.5%
    - Apply 2-3 times daily
    - Use smallest effective dose
  - Topical Antifungals
    - Nystatin Powder 100,000 U/g
    - Nystatin Oint/Creme 100,000 U/g
    - Clotrimazole 1% Creme
    - Apply 2-3 times daily
  - Topical Antibacterials
    - Mupirocin 2% Oint/Creme
    - Apply 2-3 times per day

Prevention
- Routine trach care
- Eliminate moisture at stoma site
- Ensure that trach ties are not overly tight

Bleeding

- Etiology
  - Aggressive suctioning, deep suction, lack of moisture, infection, trauma, manipulation of trach, excessive coughing
  - Suction or malnutrition may occur with routine care
  - Profuse bleeding indicates a medical emergency
- Signs/Symptoms
  - Blood tinged secretions
  - Frank blood
  - Cough

Management
- Suction only as needed to clear airway
- Identify and treat infection
- Seek emergency treatment for profuse bleeding

Prevention
- Limited suction/suction only as needed
- Humidification
- Identify and treat infections promptly

Accidental Decannulation

- Etiology
  - Tracheostomy ties become loose
  - Patient pulls tube out
  - Trach tube not held securely during care procedures
- Signs/Symptoms
  - Increased respiratory rate
  - Increased work of breathing (retractions, nasal flaring)
  - Increased heart rate
  - Decreased oxygen saturation

Management
- Verify tube placement
- Replace trach tube immediately
- If unable to insert same size, attempt size down
- If still unable to replace call 911 and provide bag-mask ventilation until help arrives

Prevention
- Ensure that trach ties are not loose
- Close monitoring of patient to prevent self-extubation
- Secure trach tube during procedures and trach care

False Passage Formation

- Trach tube is placed in a false passage anterior to the trachea
- Etiology
  - Trach becomes dislodged or decannulated in the immediate post-op period
  - Tract between skin and trachea not stable
  - Repeated insertion of trach tube before stable tract formed
- Signs/Symptoms
  - Increased respiratory rate
  - Increased work of breathing (retractions, nasal flaring)
  - Increased heart rate
  - Decreased oxygen saturation
- Management
  - Medical Emergency
  - Call 911 and provide oral bag-mask ventilation until help arrives

Prevention
- Ensure that trach ties are not loose
- Close monitoring of patient to prevent self-extubation
- Secure trach tube during procedures and trach care

Tracheal Innominate Fistula

- Abnormal connection between the innominate artery and the trachea
- Rare
- Life-threatening
- Typically occurs 3 days to 6 weeks post-tracheostomy
- Etiology
  - Pressure necrosis from high cuff pressure
  - Mucosal trauma
  - Low tracheal incision
  - Excessive neck movement
- Signs/Symptoms
  - Hemoptysis
  - Profuse tracheal hemorrhage
  - Respiratory distress
  - Cyanosis
- Management
  - Medical Emergency
  - Call 911
  - Requires immediate surgical intervention
- Prevention
  - Ensure that trach ties are not loose
  - Close monitoring of patient to prevent self-extubation
  - Secure trach tube during procedures and trach care
Tracheal Innominate Fistula cont.

- Blood flow via fistula around deflated cuff into proximal trachea

Tracheal Stenosis

- Abnormal narrowing of trachea
  - Tracheal narrowing
  - Tracheal wall thickening
  - Posterior displacement of lumen

- Etiology:
  - Infectious
  - Overinflated cuff
  - Oversized cannula
  - Prolonged intubation/cannulation
  - Excessive tube motion
  - GERD

- Signs/Symptoms:
  - Shortness of breath
  - Wheeze
  - Inspiratory stridor
  - Difficult intubation

- Management:
  - ENT referral
  - Observation for milder forms
  - Balloon dilation
  - Surgical intervention and reconstruction for severe cases

- Prevention:
  - Ensure that trach tube is secure
  - Daily trach care to prevent infection and irritation
  - Secure trach tube during procedure and trach care
  - Identify and treat GERD
  - Ensure that trach cuff is not overinflated

Tracheal Granuloma

- Growth of tissue caused by irritation of the airway
  - Commonly seen at stoma site

- Etiology:
  - Infectious
  - Overinflated cuff
  - Oversized cannula
  - Prolonged intubation/cannulation
  - Excessive tube motion
  - GERD

- Signs/Symptoms:
  - Bleeding
  - Shortness of breath
  - Wheeze
  - Inspiratory stridor
  - Difficult intubation

- Management:
  - ENT referral
  - Observation for milder forms
  - Surgical intervention for severe cases

- Prevention:
  - Ensure that trach tube is secure
  - Daily trach care to prevent infection and irritation
  - Secure trach tube during procedure and trach care
  - Identify and treat GERD
  - Ensure that trach cuff is not overinflated

Tracheomalacia

- Weakening of the tracheal wall

- Etiology:
  - Ischemic injury to the trachea
  - Chondritis
  - Weakened tracheal cartilage

- Signs/Symptoms:
  - Shortness of breath
  - Wheeze
  - Inspiratory stridor
  - Failure to wean from mechanical ventilation
  - Inability to decannulate

- Management:
  - ENT referral
  - Observation for milder forms
  - Custom trach tubes
  - Stenting
  - Surgical intervention

- Prevention:
  - Ensure that trach tube is secure
  - Daily trach care to prevent infection and irritation
  - Secure trach tube during procedure and trach care
  - Ensure that trach cuff is not overinflated

Tracheomalacia

- Normal tracheal dilatation
- Tracheomalacia
  - Inspiratory
  - Expiratory

Tracheomalacia

- Normal tracheal dilatation
- Tracheomalacia
  - Inspiratory
  - Expiratory
Aspiration
- Tracheostomy tubes may disrupt swallowing
- Etiology:
  - Compression of the esophagus
  - Dysphagia
- Signs/Symptoms:
  - Cough
  - Fever
  - Shyness of breath
  - Cricoid
- Management:
  - Identify and treat infection
  - Cuffed trach tube
  - Swallow evaluation
  - Gastrostomy tube
- Prevention:
  - Inflates cuff during and after feeding if indicated
  - Position patient upright during feedings
  - Feeding therapy

Tracheoesophageal Fistula
- Development of a connection between the trachea and the esophagus
- Etiology:
  - Perforation of the posterior tracheal wall during tracheostomy placement
  - Excessive cuff pressure
  - Distal tip of trach tube
- Signs/Symptoms:
  - Increased secretions
  - Recurrent aspiration
  - Shyness of breath
- Management:
  - Barium esophagography
  - Stenting
  - Surgical repair
- Prevention:
  - Secure trach tube during procedure and trach care
  - Ensure that trach cuff is not over-inflated

Tracheitis
- Bacterial infection of the soft tissues of the trachea
  - Common cause of morbidity among pediatric patients with a long-term tracheostomy tube
- Etiology:
  - Long-term cannulation
  - Bacterial colonization
  - Mucosal trauma and injury
- The Diagnosis of tracheitis is based on:
  - Clinical symptoms
  - Tracheoscopy (Direct visualization of trachea)
  - Results of tracheal aspirate
  - Normal chest x-ray
- Signs/Symptoms:
  - Increased tracheal secretions
  - Discolored or malodorous secretions
  - Cough
  - Fever
  - Abnormal lung sounds
- Tracheoscopy
  - Erythema
  - Irritation
  - Edema
  - Increased secretions
Tracheitis cont.

- Radiology
  - Normal chest x-ray

- Tracheal aspirate with gram stain
  - Colonization vs active infection
  - Compare previous cultures
  - WBCs
  - Bacteria

Tracheitis cont.

- Management
  - Treatment based on:
    - Recent tracheal aspirate
    - Current gram stain results
    - Degree of symptoms

- Common causes of bacteria tracheitis with treatments
  - Pseudomonas
    - Inhaled Tobramycin 80mg BID for 7-10 days
    - Ciprofloxacin 20-30 mg/kg/24 hr iQ12 hr
  - MRSA
    - Sulfamethoxazole and TMP 8-12 mg/kg/24 hr iQ12 hr
    - Clindamycin 10-30 mg/kg/24 hr iQ6-8 hr
  - Serratia
    - Ciprofloxacin 20-30 mg/kg/24 hr iQ12 hr
    - Sulfamethoxazole and TMP 8-12 mg/kg/24 hr iQ12 hr
  - Stenotrophomonas
    - Sulfamethoxazole and TMP 8-12 mg/kg/24 hr iQ12 hr
    - Levofloxacin 10 mg/kg/dose iQ 12 hr

Conclusion

- Caring for a child with a tracheostomy at home can be challenging for health care providers, parents, and caregivers. Comprehensive education and preparation are key to ensure positive outcomes for these patients.

References

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