Tracheostomy Care

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Learning Objectives:
- Explain the indications, rationale and complications for tracheostomies.
- Compare various tracheostomy tubes with respect to their features and clinical applications.
- Describe tracheostomy care clinical procedures.
- Solve common clinical problems that occur among tracheotomized patients.
- Enable communications for patients with artificial airways.

Introductory Information

Definitions
- **Tracheotomy**- surgical procedure for insertion of tube
  - operating room technique
  - bedside (percutaneous) technique
- **Tracheostomy**- hole (stoma) created by procedure

Click to see a video on percutaneous tracheotomy (4 min.)
http://www.cookmedical.com/cc/educationMedia.do?mediaId=4189

Tracheostomy Indications

- Maintain airway patency- bypass obstructions
  - airway anomalies- obstructive sleep apnea
  - neoplasm
  - inflammation, edema; e.g., burns
  - foreign body aspiration; e.g., a fish!!

- Facilitate secretion removal
- Long-term positive pressure ventilation
- Prevent aspiration
- Reduce anatomic dead space-palliative procedure for emphysema
Complications With Tracheostomy
- hemorrhage - early and late
- infection - lower airways and stoma
- airway obstruction
  - secretions
  - dislocated tube

Complications With Tracheostomy
- cuff pressure damage
  - tracheoesophageal fistula
  - tracheomalacia
  - tracheal stenosis

Complications With Tracheostomy
- Psychosocial complications
  - loss of aesthetic appeal
  - communication barrier
  - embarrassment, depreciated self-image

Tracheostomy Tubes
- Silver (Jackson) tube
  - uncuffed
  - long-term or permanent
  - components
    - outer cannula - main tube
    - inner cannula
    - obturator - for insertion

Tracheostomy Tube Types
- Materials
  - silver (Jackson) tube
  - plastic
  - combination plastic and metal wire

FYI - click to see video on tracheal reconstruction
Requires Quicktime viewer (7 min)
http://www.kuleuven.ac.be/cltr/movies/m02_04.html

FYI - Link to article by Hess D, in RC
http://www.rcjournal.com/contents/04.05/04.05.0497.pdf

Click to see tracheoesophageal fistula

Click to see tracheomalacia & stenosis
http://ars.els-cdn.com/content/image/1-s2.0-S1043067909000859-gr1.jpg
Tracheostomy Tube Common Brands

- Portex
- Shiley
- Bivona- foam cuff

FYI - Link to SIMS Portex Tracheostomy Handbook: A guide for the Healthcare provider (52 pages)

Tracheostomy Tube Types

- Cuffed- for:
  - positive pressure ventilation
  - prevention of aspiration

- Portex™ tracheostomy tubes

- single cannula
- disposable inner cannula
- obturators

FYI - Link to Nellcor (Shiley™)
http://www.nellcor.com/prod/list.aspx?S1=AIR&S2=TTA

Tracheostomy Tube Types

- Bivona™ foam-filled cuff
  - low pressure cuff

- in-line adapter

FYI - Link to Aaron’s tracheostomy page
http://www.tracheostomy.com/resources/articles/tracheostomy/index.htm

Tracheostomy Tube Types

- Uncuffed- for:
  - pediatric patients - they grow

FYI - Link to Sims Portex Tracheostomy Handbook: A guide for the Healthcare provider (52 pages)

Tracheostomy Tube Types

- Inner cannula- inner sleeve that can be removed and cleaned or replaced to maintain patency
- Shiley™ disposable inner cannula tube
- Portex™ disposable inner cannula tube

FYI - Link to Nellcor (Shiley™)
http://www.nellcor.com/prod/list.aspx?S1=AIR&S2=TTA
Tracheostomy Tube Types

- Fenestration
  - weaning to decannulation
  - permit speech

Fenestration complications
- anatomic incompatibility - ineffective
- irritation
  - inflammation
  - scar formation
  - obstruction

FYI - Link to case report of fenestration complication
http://www.thefreelibrary.com/_/print/PrintArticle.aspx?id=14196607

Tracheostomy Tube Types

- Portex™ Evacuation Tube
  - evacuation port
  - vacuum connector

Purpose - single-lung or independent lung ventilation for patient with permanent tracheostomy

FYI - Link to information on NCC double-lumen tube
http://www.uam.es/departamentos/medicina/anesnet/journals/ja203nt/dlt.htm

Tracheostomy Tube Sizes

- Confusion among brands - no standardization
- Shiley™ size 6 is closest size to Portex™ size 8.
- When changing brands, we need to find the external diameters

Tube lengths - larger tube = longer tube
- Extra long tubes
  - proximal XLT for thicker neck
  - distal XLT to bypass airway abnormalities
  - ETT may be necessary in emergencies
Tracheostomy Tube Sizes

- Extra long tubes
  - Proximal XL
  - Distal XL

Shiley™ XLT Tubes

BIVONA TTS Hyperflex Tracheostomy Tube

- Adjustable to accommodate unusual anatomy or pathology
- Intended for temporary use until proper length can be obtained.
- Can be sterilized
- Not MRI compatible - wire inside tube

Click for image and information on the Hyperflex™ tube

Tracheostomy Patient Management

Tracheostomy Assessment

- General appearance
  - level of consciousness
  - color
  - evidence of increased WOB
    - chest retractions
    - abdominal paradox - "see-saw"
    - abdominal contractions during exhalation
    - nasal flaring

- Cough effectiveness - ceiling test
- Secretions
- Auscultation
  - need for suctioning
  - cuff air leak

- Tube anchoring tie
  - appropriate tension - critical for new stoma
  - cleanliness
  - tension
- Dressing - secretions, exudates
- Stoma
  - inflammation, infection
  - secretions from upper airways
Tracheostomy Assessment

- Secretions
  - above cuff- around stoma
  - below cuff- from tube lumen
- Patency of lumen
  - Ease of catheter insertion
  - Inner cannula inspection

Tracheostomy Care Equipment

- Always at bedside
  - Manual resuscitator
    - O2 source
    - mask- in case of decannulation
  - Tube obturator
  - Spare tracheostomy tube
  - Disposable inner cannulae (if applicable)

Tracheostomy Care Equipment

- Humidification- at least HS
  - cold nebulizer to tracheostomy collar- not recommended by AARC Clinical Practice Guideline
  - heated humidifier is recommended
- heat and moisture exchanger (HME)

FYI - Link to AARC CPG on bland aerosol therapy
http://www.rcjournal.com/cpgs/pdf/05.03.0529.pdf

Tracheostomy Care Equipment

- Suction equipment, catheters
- Stoma dressing or kit
- Tube anchoring ties

Tracheostomy Care Equipment

- Normal saline solution
- Hydrogen peroxide
- Cuff pressure manometer

Click to see PressureEasy™ Cuff Pressure Controller

Tracheostomy Care Procedure

- Precautionary note
  - a new stoma (48-72H) will close if tube is removed; so, ties are not changed during first 2-3 days.
Tracheostomy Procedures

- Routine tracheostomy care
  - two caregivers
  - suction trachea, if needed
  - suction above tube cuff
  - clean stoma
  - change tube tie
  - check tube tie tension
  - exchange or clean inner cannula
  - adjust cuff pressure

Click for video of tracheostomy care procedure (7.3)
http://www.youtube.com/watch?v=4kwQFSUu4lA&feature=related

- Suctioning
  - may stimulate or encourage cough, instead of suctioning
  - frequent, deep suctioning damages airways
  - saline should not be instilled, unless there are plugs or thick secretions

FYI - click for video of tracheostomy suctioning (9.5)
http://www.youtube.com/watch?v=UVuPzhOWxRs

- Tracheostomy tube change
  - First two weeks - physicians
  - Change monthly or as needed
    - different size
    - different type
  - Two-person procedure
  - Check new tube
  - Follow policies & procedures

Click for video of tracheostomy tube change (6.5)
http://www.youtube.com/watch?v=s2S_wTRnjJw

Problems & Troubleshooting

- Secretions leaking around stoma
  - inadequate swallowing
  - inadequate above-cuff hygiene

- Oral secretions from lumen of tube
  - inadequate cuff seal
  - tracheoesophageal fistula

- Tube cuff leak
  - signs
    - upper airway secretions (food?) from lumen of tube
    - patient vocalization
    - audible rush of air at neck
    - ventilator exhaled tidal volume loss

- causes
  - inadequate inflation
  - air loss from pilot valve
  - inadequate tube size
  - tracheomalacia

- solutions - surgery is definitive
  - change tube
  - increase tidal volume setting
  - negative pressure ventilation
  - high-frequency ventilation
Problems & Troubleshooting

Obstruction
- Signs
  - Patient distress, desaturation
  - Ventilator high-pressure alarm
- Causes
  - Thick mucous, plugs
  - Tube displacement

Problems & Troubleshooting

Partial obstruction - solutions
- Lavage, suction plugs
- Realign tube in airway (bronchoscope)

Problems & Troubleshooting

Complete obstruction
- Code, rapid response
- Attempt to pass catheter to check patency
- Deflate cuff, ventilate with bag and mask
- Decannulate and seal stoma to ventilate with bag and mask
- Emergent endotracheal intubation
- Misplaced tube - tube reinserted

Problems & Troubleshooting

Accidental decannulation
- Causes
  - Tube ties inadequately secure
  - Cough
- Signs
  - Visible decannulation
  - Obstruction
  - Patient distress, desaturation
  - Subcutaneous emphysema

Problems & Troubleshooting

Accidental decannulation
- Solutions
  - Completely remove the tube
  - Seal stoma
  - Bag-mask ventilate
  - Reinsert tube

Problems & Troubleshooting

Severe hemorrhage
- Sign: Severe hemorrhage from tube, stoma
- Cause: Erosion of innominate artery
- Actions:
  - Apply direct pressure over artery
  - Surgical intervention

Click for images of innominate artery and tracheostomy:
http://www.jkns.or.kr/fulltext/htm/0042011021f2.htm
Weaning & Decannulation

Assessment for Decannulation
- Clinical stability
- Mental status
- Purpose of tracheostomy
- Upper airway patency
- Need for positive pressure ventilation
- Ability to cough- peak expiratory pressure (>40 cm H2O)
- Secretions- amount, viscosity

FYI - Link to RC article on decannulation (2005)
http://www.rcjournal.com/contents/04.05/04.05.0538.pdf

FYI - Click to bookmark slideshow on swallow evaluation
http://www.uiowa.edu/~c003236/Lecture5/sld001.htm

Click to see FEESST videos of normal and abnormal swallowing (2 min. Requires free Quicktime viewer)
http://www.feesst.com/video.html

Progression To Decannulation
- Adopt or develop a protocol
- Replace tube with smaller size (<4 mm, if plugging tube)
- If swallowing is adequate, cuffless tube may be used
- If cuff is needed, may change to fenestrated tube
- Decannulate only after at least 24 hours without need for ventilation

Permanent Tracheostomy
- Indications
  - ventilator dependence
  - upper airway obstruction
  - obstructive sleep apnea
  - emphysema- dead space reduction

Click to see images of the tracheostomy button
http://www.natus.com/index.cfm?page=products_1&crid=124

Permanent Tracheostomy
- Tracheostomy tubes
  - cuffed, for ventilation
  - uncuffed, metal or plastic
  - tracheostomy button
Aphonia Complications
- Inability of patient to communicate symptoms, problems, needs
- Frustration, psychological damage to patient
- Frustration on part of caregivers
- Deficient patient care

Communication Methods
- Written communication
- Communication boards
- Lip reading (speech reading)
- Laptop computers
- Text-to-speech devices
- Artificial larynx
- Speech-enabling tracheostomy tubes
- Speaking valves

Communication Methods
- Written communication
  - advantages
    - readily available
    - inexpensive
    - effective with ETT (if unrestrained)
  - disadvantages
    - slow
    - legibility
    - literacy, language barriers

Communication Methods
- Communication boards
  - display ideas, as well as letters
  - advantages
    - more effective than writing
    - relatively inexpensive (some are free)
    - available
    - effective with ETT

Click to see video of Vidatak in ER (1 min.)
http://www.youtube.com/watch?v=PSbal5aCbWs
Click to see Vidatak ICU EZ Board™ (scroll down)
http://www.vidatak.com/icuboard.html

Communication Methods
- Lip reading (speech reading)
  - advantages
    - fast
    - no cost
  - disadvantages
    - ineffective with ETT
    - caregivers need to acquire skill

Click for tips on speech reading
http://www.michdhh.org/assistive_devices/speechreading.html#tips
Communication Methods

- **Artificial larynx**
  - **advantages**
    - fast communication
    - easy to learn
  - **disadvantages**
    - expense - justifiable
    - availability - depends
    - ineffective with ETT

Click for demonstrations of Truetone™ artificial larynx (3.5 min.)
http://www.griffinlab.com/Products/Electrolarynx-Video-and-Audio-Examples.html

Communication Methods

- **Speech-enabling tracheostomy tubes- air flow through vocal cords**
  - **advantages**
    - fast communication
    - easy to learn (for some patients)
    - relatively inexpensive
  - **disadvantage - uncomfortable for some patients**

Click to see Portex™ talking tracheostomy tube

Communication Methods

- **Text-to-speech devices**
  - **advantages**
    - relatively fast
    - effective with ETT
  - **disadvantages**
    - expense
    - literacy

FYI - Link to Zygo text-to-speech devices

Communication Methods

- **Laptop computers**
  - **advantages**
    - text-to-speech software available
    - keyboard or mouse
    - inexpensive - can be
    - fast - can be
  - **disadvantages**
    - requires literacy

Click for links to computer-based communication aids
http://www.etriloquist.com/alslinks.html

Speaking Valves

- **Operation- one-way valve permits inspiration through tracheotomy; then directs exhaled air through vocal cords**
### Speaking Valves

**Benefits**
- permits phonation
- improves quality of life
- used for patients on or off the ventilator
- facilitates cough, expectoration
- facilitates swallowing - increases pharyngeal pressures to move food down into the esophagus

**Benefits**
- restores physiologic PEEP
- restores sense of smell and taste
- reduces infection - eliminates the need for digital occlusion
- facilitates decannulation by:
  - eliminating the need to cap or plug the tracheostomy tube
  - building patient confidence and reducing anxiety

**Benefits**
- facilitates ventilator weaning by:
  - restoring physiologic PEEP
  - improving patient mood, confidence
  - assists re-training of ventilatory muscles

**Contraindications:**
- clinical instability
- severe upper airway obstruction
- tenacious pulmonary secretions
- inflated cuff or foam-cuffed tube
- decreased level of consciousness
- increased aspiration risk
- compromised lung mechanics
- hours of sleep

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**Passy-Muir Valve family**

Image courtesy of Passy-Muir, Inc.

FYI - Link to Passy-Muir™
http://www.passy-muir.com/
Speaking Valves
✓ Nellcor Phonate™ speaking valve

Click to see Nellcor Phonate™ valve
http://image.wisdomking.com/images/pictures/0/7/photo_114.jpg

Patient assessment
✓ Swallowing ability- usually an ENT/speech therapy evaluation
  ◆ blue dye test- does not identify source of problem
  ◆ fiberoptic endoscopic evaluation of swallowing with sensory testing (FEESST)

Patient assessment
✓ Medical stability
  ◆ vital signs
  ◆ oxygenation
✓ Level of cognition
✓ Motivation - desire to speak
✓ Tolerations of cuff deflation
✓ Secretion quantity and viscosity
✓ Airway patency- ability to exhale around tube with cuff deflated

Initial Placement (non-ventilated)
✓ Educate patient & staff
✓ Position patient- sitting
✓ Suction patient- tracheal & oral
✓ DEFLATE THE CUFF
✓ Attach valve
✓ Monitor patient
  ◆ Vital signs, SpO2,
  ◆ distress, anxiety
  ◆ phonation

Initial Placement (ventilated)
✓ Assess patient
✓ Record ventilator parameters
✓ Position patient- sitting
✓ Suction patient- tracheal & oral
✓ DEFLATE THE CUFF
✓ Attach valve to ventilator circuit

Initial Placement (ventilated)
✓ Adjust ventilator controls to compensate for leak
✓ Adjust TV for same PIP as before cuff deflation
**Initial Placement (ventilated)**
- Monitor patient
  - SpO2
  - vital signs
  - signs of distress, anxiety
  - phonation
  - PIP, TV
  - chest excursion

**Summary and Review**
- Introductory information
  - indications
  - complications
- Tracheostomy tubes
  - types
  - features
  - sizes

**Summary and Review**
- Tracheostomy patient management
  - patient assessment
  - tracheostomy care equipment
  - routine care
  - troubleshooting
- Weaning and decannulation

**Summary and Review**
- Communication by tracheotomized patient
  - written communication
  - alphabet boards
  - lip-reading (speech reading)
  - computer-based devices
  - artificial larynx
  - speech-enabling tracheostomy tubes
  - speaking valves

**References**
- Christopher KL. Tracheostomy decannulation. Respir Care 2005;50:538-541.