PERCUTANEOUS DI LATIONAL TRACHEOSTOMY

SI CU

July 2010
OBJECTIVES

- knowledgeable of the complications of the procedure and their prevention.

- understand the procedure of percutaneous tracheostomy.

- perform a dilational percutaneous tracheostomy.
WHY?

- Safe
- Cost effective
- Easy to teach
- Bedside procedure
Percutaneous dilatational tracheostomy versus surgical tracheostomy in critically ill patients: a systematic review and meta-analysis

- 17 RCT between 1991 and 2006
- 1,212 patients

- PDT has lower infection rate
  OR 0.28 (CI 0.16 - 0.49, p<0.001)

- No difference in PDT and ST for
  - bleeding
  - major procedural complications
  - long term complications
  - mortality

- Subgroup analysis of PDT versus ST performed in the OR
  - Significantly less bleeding
    OR 0.29 (CI 0.12 – 0.75)
  - Lower mortality
    OR 0.71 (CI 0.5 – 1.0)

Meta-analysis of PDT vs ST effect on mortality

Pooled estimate of OR = 0.79 (95% CI 0.59 to 1.07, p=0.13)

Delaney A. Crit Care 2006; 10:R55
ADVANTAGES

■ Infection rate (1-2%)
■ Stenosis (0-4%)
■ Procedural time (5-15 min)
■ Procedural cost (50% less)
■ Subglottic airway
■ Improved cosmetic results
■ No transport related mortality
■ No scheduling delays
INDICATIONS

- Prolonged ventilatory support
- Airway control
- Upper airway obstruction
- Pulmonary toilet
RELATIVE CONTRAINDICATIONS

- Emergency tracheostomy
- Pediatric applications
- Midline neck mass
- Non-intubated patients
- Recent surgical procedure
RELATIVE CONTRAINDICATIONS

- PEEP value greater than or equal to 20
- Uncorrected coagulopathy
- Hemodynamic instability
THE PROCEDURE
Our Kits

Ciaglia Blue Rhino™ Percutaneous Tracheostomy Introducer Set
With EZ-Pass™ Hydrophilic Coating

ATTENTION
Activate hydrophilic coating prior to use by wetting surface of dilator with sterile water or saline. For best results, maintain wet condition of dilator during placement. READ PRODUCT INSERT PRIOR TO USE.

COOK CRITICAL CARE
P.O. Box 489, Bloomington, IN 47402-0489 U.S.A.

Ciaglia Blue Rhino™ Percutaneous Tracheostomy Introducer Set
C-PF15-100-HC
612115
0.02" / 55cm
8.0f/29cm

CardinalHealth

STRL PERCUTANEOUS PRO 90768 PK
Our Kits
KIT CONTENTS
Tracheostomy

Select XLT if BMI > 35 or Significant Subcutaneous Edema.

Always have the XLT available in the room.
TIME OUT

• Every procedure should have a time out

• This is a supplemental time out to prevent adverse events

• Must have attending present to start

SICU Check off sheet for Percutaneous Tracheostomies

Consent signed

Attending present

BMI

>35 or significant soft tissue edema

Recommend – Shiley 6 or 8 XLT

Medications in Room

Fentanyl 500 mcg

Vecuronium 20 mg

Versed 10 mg

Diprovan 50 cc vial

Lidocaine 2% with epi

Ventilator on Volume Control mode, rate of 12 and O2 at 100%

Ambu bag in room, connected to O2, and O2 turned on

Intubation tray in room or just outside door

CO2 detector, scissors, 10cc syringe, accordion trach extender, and suction set up at head of bed with airway nurse
PREPARATION

PATIENT AIRWAY
- Endotracheal tube in place
- Emergency equipment available
VENTILATORY SUPPORT

- Increase FiO2 to 100%
- Assure adequate rate and volume for paralyzed patients.

--Volume Control Ventilation
PREPARATION

MONITORING

1. Electrocardiogram
2. Blood Pressure
3. Pulse Oximetry
**PREPARATION**

- Pharmaceuticals
  1. Narcotic
  2. Amnestic
  2. Paralytic Agent
**PREPARATION**

- ASSISTANTS
  1. surgical resident(s)
  2. airway assistant
  3. medication nurse
Personal Protective Equipment

All others in the room should wear a cap and mask as well.
POSITION AND PREPARE THE PATIENT

- Supine position
- Place a pillow or blanket roll under the shoulders & MAXIMIZE extend neck
Palpate anterior neck & choose site
PREPARATION

- Prep entire neck with chlorhexidine
**PREPARATION**

- Drape site with 4 sterile towels and Full Drape
Full Drape

Split sheet toward the head.
Prepare the Equipment
Open the Cook Perc Trach set on the Bed.
Prepare the Trach

This is an XLT.

Place the inner cannula toward the head of the bead to insert after tracheostomy insertion.

Check the balloon for leak: fully inflate and deflate.

Cut and Place trach ties on the trach bolsters
TUBE SET-UP

Insert obturator/dilator into tube
Setup

Two needle drivers with silk suture placed at the end of the bed.

Local anesthetic

Lubricant
Operator to the Patient’s Right

Select Site
1. ~ 2cm incision suprasternal notch
2. 2nd - 3rd tracheal ring

Infiltrate the site with local anesthetic.
GOLDEN RULE #1

IF AT ANY TIME DURING THE PROCEDURE, ANYTHING DOESN'T LOOK OR FEEL "RIGHT,"
STOP!
REMOVE EVERYTHING, AND START OVER!!!
Incision

Create a longitudinal incision with a #10 blade scalpel

Location: between the thyroid cartilage and the sternal notch.

Length: about 2 cm

Note the inner cannula secured at the bottom of the screen.
Dissection

Continue to evaluate your blunt dissection to ensure location in the midline and proximity to target tracheal ring.
Prepare the Airway

Once adequate dissection has occurred and the target tracheal space can be palpated, Prepare the Airway.

Per the Proceduralist at the Head:

- Suction the endotracheal tube
- Suction oral, laryngeal pharynx
- Position ETT above the chosen insertion site confirmed by palpation.
Prepare the Airway

As the proceduralist withdraws the ETT, palpate the target tracheal space with your finger until you feel the ETT pass proximal.

Give clear feedback regarding position and instructions to advance or withdraw.
Insert needle with Angiocath into trachea
HELPFUL HINTS

- Enter the trachea vertically, aspirate as needle advanced
- As needle enters the tracheal, bubbles will appear
- If needle hits cartilage, walk it over or under it

- Ensure that needle has not impaled endotracheal tube
  1. Check with the proceduralist
  2. Rotate and/or oscillate tracheal tube
Confirmation of Tracheal Access

- Withdraw air bubbles into syringe.
- Remove syringe
- Inject saline into angiocath/needle
- Air and water spurting out.
- Pass wire without resistance.
Pass Wire

Stabilize the needle cannula *(left hand)*

The J-wire must pass distally without resistance (at least 10 cm) *(right hand)*

Once the wire has passed, remove the needle/angiocath.
GOLDEN RULE #2

IF THERE IS ANY QUESTION ABOUT THE PLACEMENT OF THE GUIDE WIRE, REMOVE IT AND THE NEEDLE AND START OVER!!!
Place small dilator over wire and Dilate 3 times
Place large dilator with inner guide over guidewire
Serial Dilation

Use the curve of the Blue Rhino and advance into the airway several times up to the level of black “skin” line.
Dilate tract
Remove the Blue Rhino

Leave the wire
Leave the white cannula in place
Remove large dilator leaving white inner guide in place over wire.
Place the Trach

Place the trach over the wire and white cannula left in place.

Use the curve of the trach to advance the tube over the wire.

You should feel 2 “pops” in.
Advance Trach

Feel 2 “pops” in
Pass tube and obturator/dilator over guiding catheter.
Remove obturator/dilator, guiding catheter, and the guide wire as a single unit.
Establish New Airway

- Place the Inner Cannula
- Inflate the Balloon
- Connect the ventilator to the Inner Cannula

**Confirmation of New Airway**
- Color Change on CO2 detector
- Return of volume on the ventilator
- Maintenance of O2 saturation
GOLDEN RULE #3

ALWAYS CHECK POSITION OF TRACHEOSTOMY TUBE BEFORE REMOVING THE ENDO-TRACHEAL TUBE

&

REMEMBER GOLDEN RULE #1
Suture tube in place AND secure with trach ties
Secure Airway

One Suture on either end of the tracheostomy.

Bring trach tie around the neck and tie together.

Note the ventilator connector with CO2 detector (yellow)

Airway Proceduralist holds the trach in place while the residents secure with suture.
POST-PROCEDURE CHECK LIST

- Bilateral breath sounds
- Tidal volume return
- Pulse oximetry
- Arterial blood gases
- Chest X-ray
PROCEDURAL PROBLEMS

BLEEDING DURING PROCEDURE

1. Direct pressure between dilations
2. Subcutaneous bleeding ends with tube insertion
3. Significant, deeper bleeding may need to be tied, cauterized, etc.
DIFFICULTY PASSING DILATORS

1. Needle and guide wire may have penetrated cartilage ring
2. Needle may have impaled endotracheal tube or be adjacent to tube
3. Skin incision too small

Remember GOLDEN RULE #1
PERCUTANEOUS TRACHEOSTOMY

COMPLICATIONS

PREVENTION AND MANAGEMENT
POTENTIAL COMPLICATIONS
OVERALL INCIDENCE - 0-28%

- Hemorrhage
- Pneumothorax
- Paratracheal insertion
- Tracheal laceration
- Cardiorespiratory decompensation
- Stomal infection
- Accidental - premature decannulation
- Granuloma formation
- Tracheal stenosis
FALSE PASSAGE

- Puncture of posterior tracheal wall
- Failure to secure needle while inserting guide wire.
- Failure to pull tracheal tube back far enough
- Failure to have assistant stabilize guide wire and guiding catheter.
**PNEUMOTHORAX**

- Usually from excessive wire or dilator insertion
- Have chest tubes and tray available
- Always verify breath sounds and obtain post-procedure CXR
RESPIRATORY DECOMPENSATION

- Prevent hypoxia and hypercarbia
- Maintain endotracheal tube position
- Place patient on 100% oxygen
- Provide adequate “controlled” ventilation.
- Monitor O2 saturation
- Laryngoscope and endotracheal tube immediately available
CO2 RETENTION

- Ensure that ventilator settings provide adequate volumes
- Select appropriate bronchoscope
- Remove bronchoscope to allow ventilation
ACCIDENTAL DECANNULATION

- May occur with any tracheostomy
- If occurs early, orally intubate and repeat the procedure.
- After 48 - 72 hrs,
  1. insert 16g needle in stoma site
  2. thread wire through needle into trachea - remove needle
  3. place guide catheter over wire - insert trach tube over catheter
Patient 1:

- 63 y.o. female underwent resection of head and neck SCCA with myocutaneous flap
- 409 pounds (BMI 60)
- 6 Shiley inserted in the OR
- POD #2 arrested and died secondary to migration of tracheostomy into subcutaneous tissue
Claims related to tracheostomy tube dislodgement

- 4 tracheostomy tube dislodgements
- All related to length of tracheostomy tube

1. BMI 60 6 Shiley
2. BMI 31 + critically ill 8 Shiley
3. BMI 40 8 Shiley
4. BMI 28 + 90% burn 8 Shiley
What length tracheostomy?
Effect of tracheostomy tube length
Length of tracheostomy tubes

- Shiley 8 79 mm
- Shiley 8 long 89 mm
- Shiley 9 99 mm
- Shiley 8 X-long 105 mm
- Shiley 10 109 mm
Recommendations for tracheostomy tube length

- All patients with a BMI $\geq 35$ should have a Shiley X-long 8 or 9 tube

- All patients with massive resuscitation and/or severe soft tissue edema should have a Shiley tube longer than an 8

- Hyperinflation of the cuff to prevent leak and malposition on CXR are significant danger signs
SUBGLOTTIC GRANULOMAS & STENOSIS

- From too high of a tracheostomy site
  2nd - 3rd space ideal

- From using commercially fenestrated tubes
  1. Not fitted to patients airway anatomy
  2. Wean by down sizing with uncuffed tube.
HOW TO INSURE AGAINST ADVERSE OUTCOMES

- Cautious patient selection
- Advance review of technique
- Be prepared to deal with complications
- Follow the GOLDEN RULES
CAUTIOUS PATIENT SELECTION
Initially - use only on ideal patients

- Long thin necks, with easily palpated spaces
- Avoid patients requiring high FiO2 and high level PEEP
- Hemodynamically stable
- No coagulation problems
BE PREPARED

- Resuscitation equipment
- Emergency drugs
- Intubation equipment
- Surgical backup
REMEMBER THE GOLDEN RULES
Credits

- Addison May, MD
- Cynthia Talley, MD
- Christy Thomas, RN: SICU Procedure Nurse