

PERCUTANEOUS DILATIONAL TRACHEOSTOMY

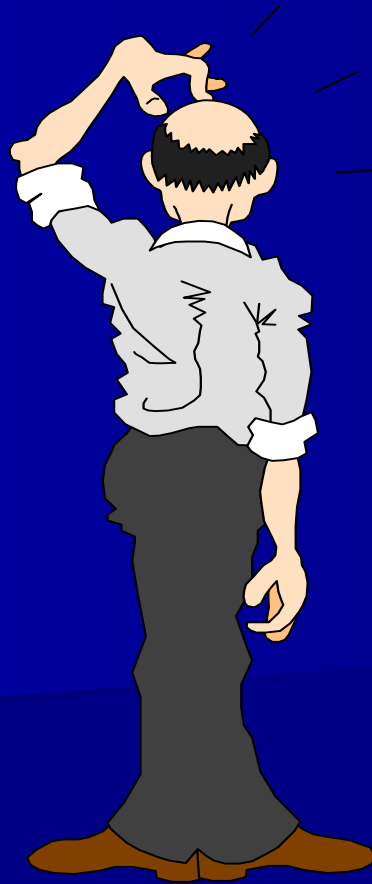
SICU

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 PERCUTANEOUS TRACHEOSTOMY



WHY ?

- Safe
- Cost effective
- Easy to teach
- Bedside procedure

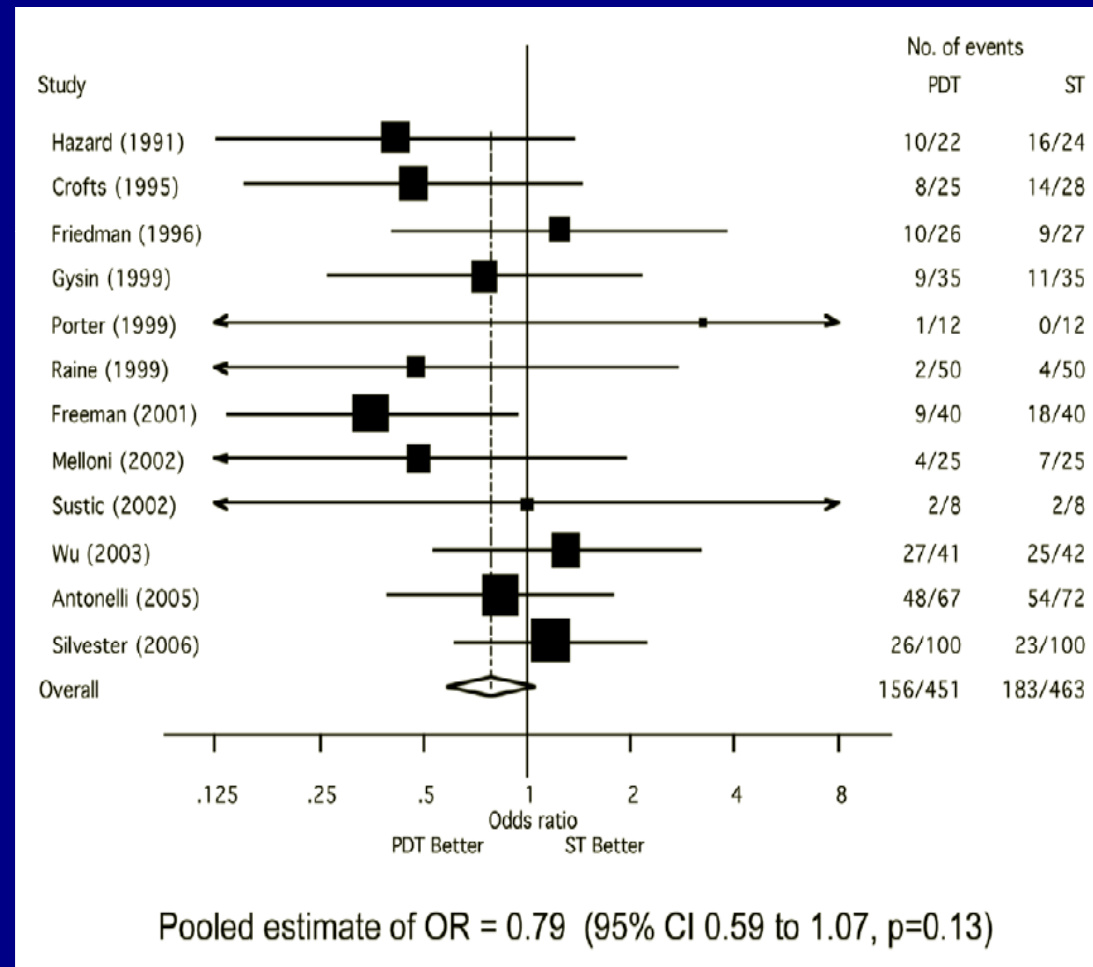


Percutaneous dilatational tracheostomy versus surgical tracheostomy in critically ill patients: a systematic review and meta-analysis

- 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



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

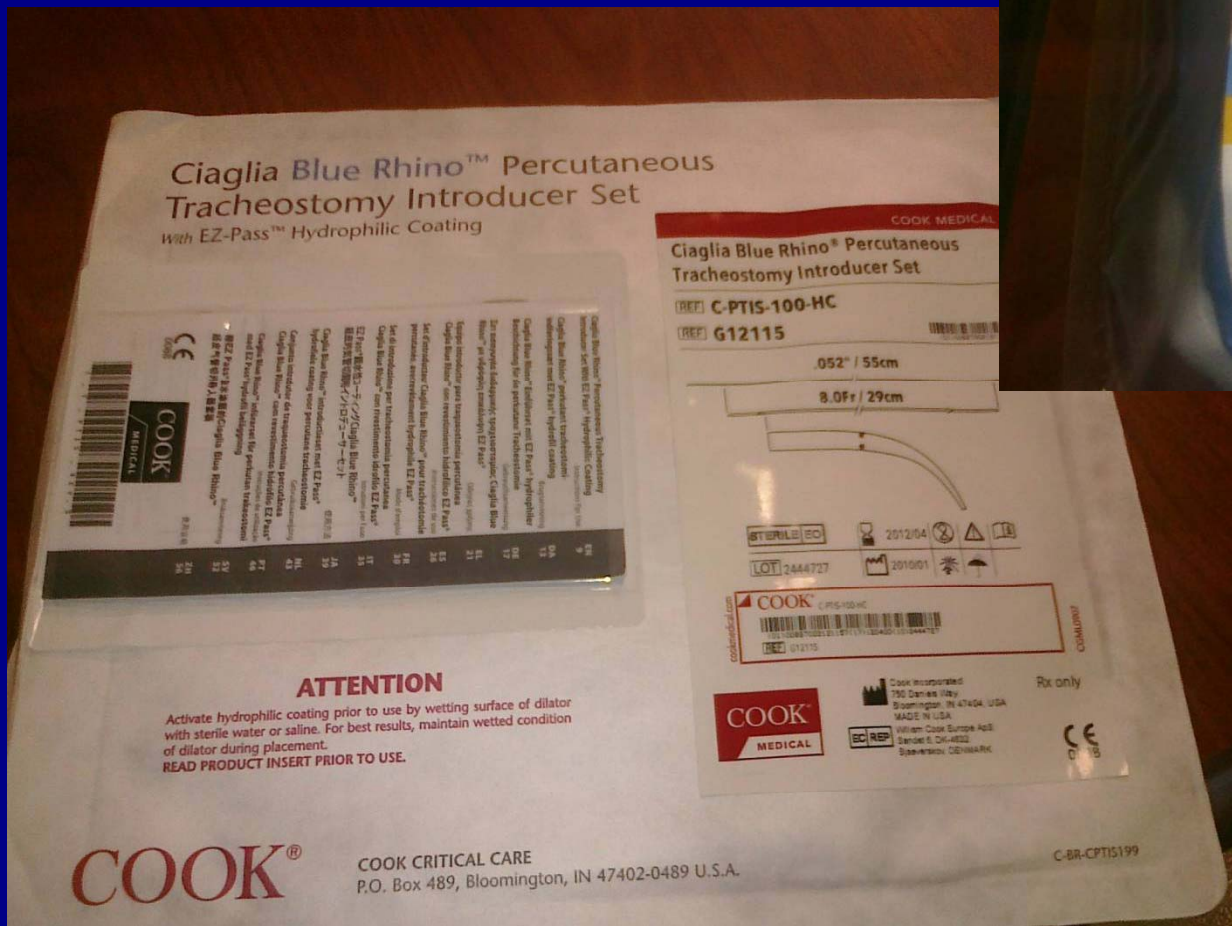


COOK[®]

Ciaglia
BLUE RHINO
Percutaneous Tracheostomy Introducer Set



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ADULT TRACHEOSTOMY INSTRUMENTS PAN 2

PETRO CENTER

CensTrac



ENT

STEAM

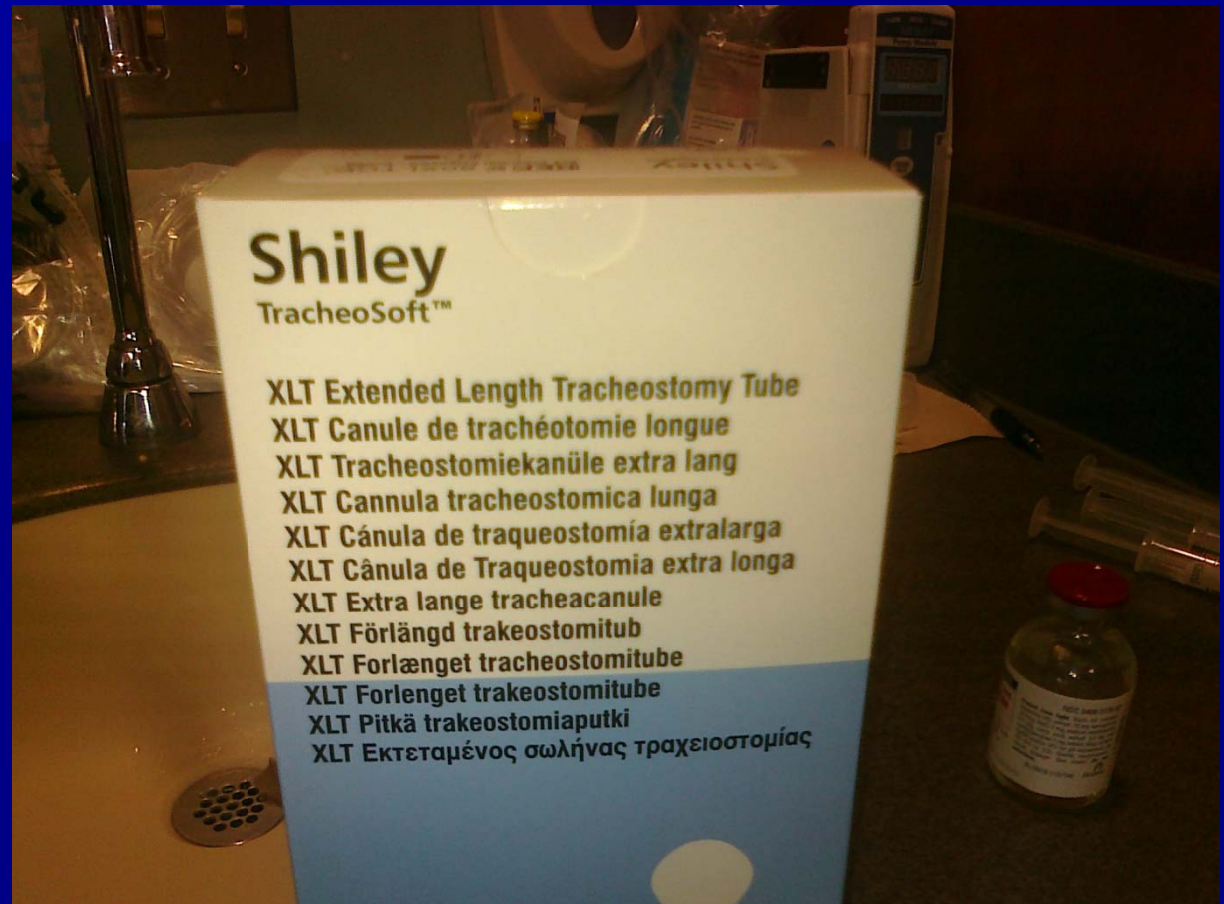
KIT CONTENTS



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



PREPARATION

■ VENTILATORY SUPPORT

- Increase FIO₂ to 100%
- Assure adequate rate and volume for paralyzed patients.
- Volume Control Ventilation



PREPARATION

■ MONITORING

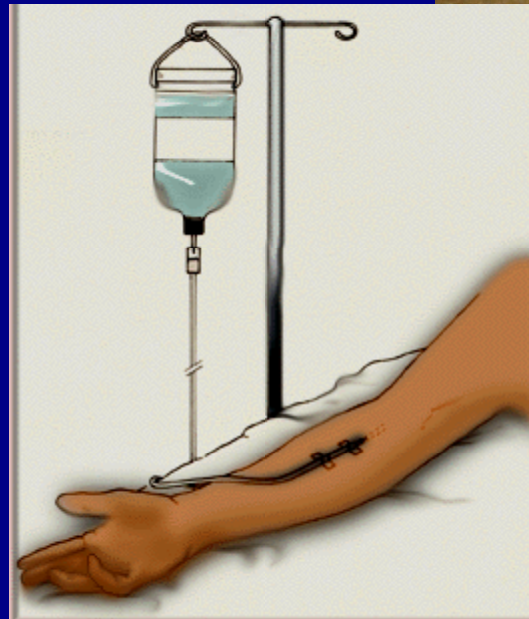
1. Electrocardiogram
2. Blood Pressure
3. Pulse Oximetry



PREPARATION

■ Pharmaceuticals

1. Narcotic
2. Amnestic
2. Paralytic Agent



PREPARATION

■ ASSISTANTS

1. surgical resident(s)
2. airway assistant
3. medication nurse



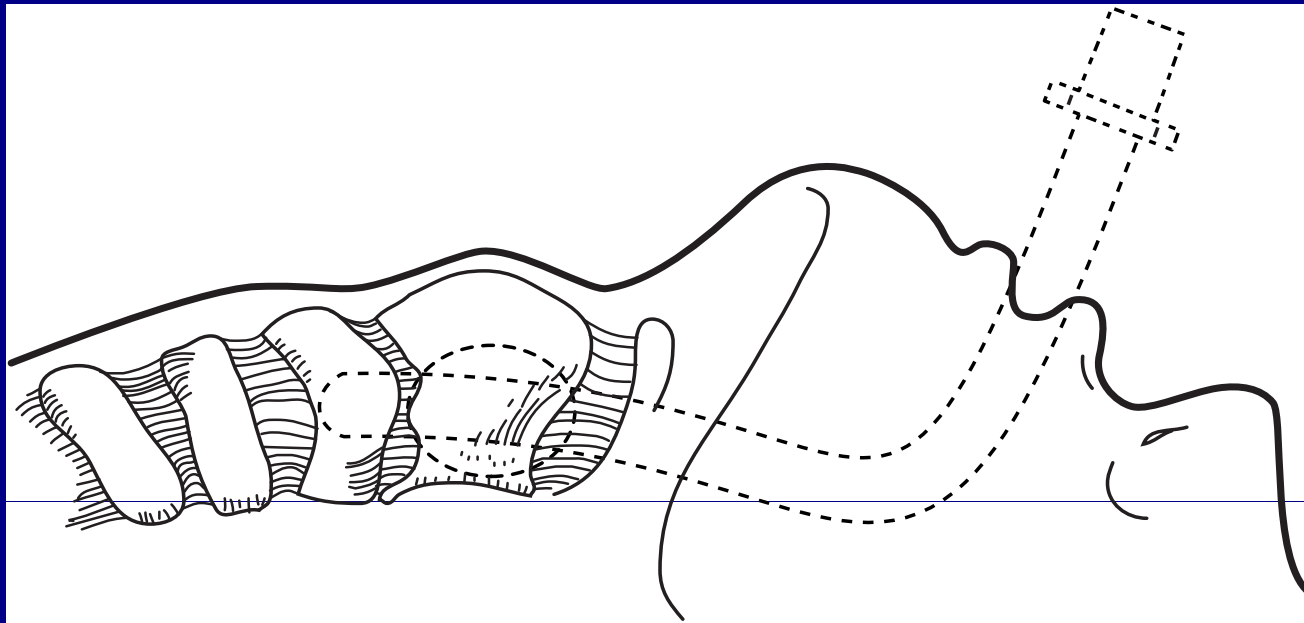
Personal Protective Equipment

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 & MAXIMALLY extend neck**

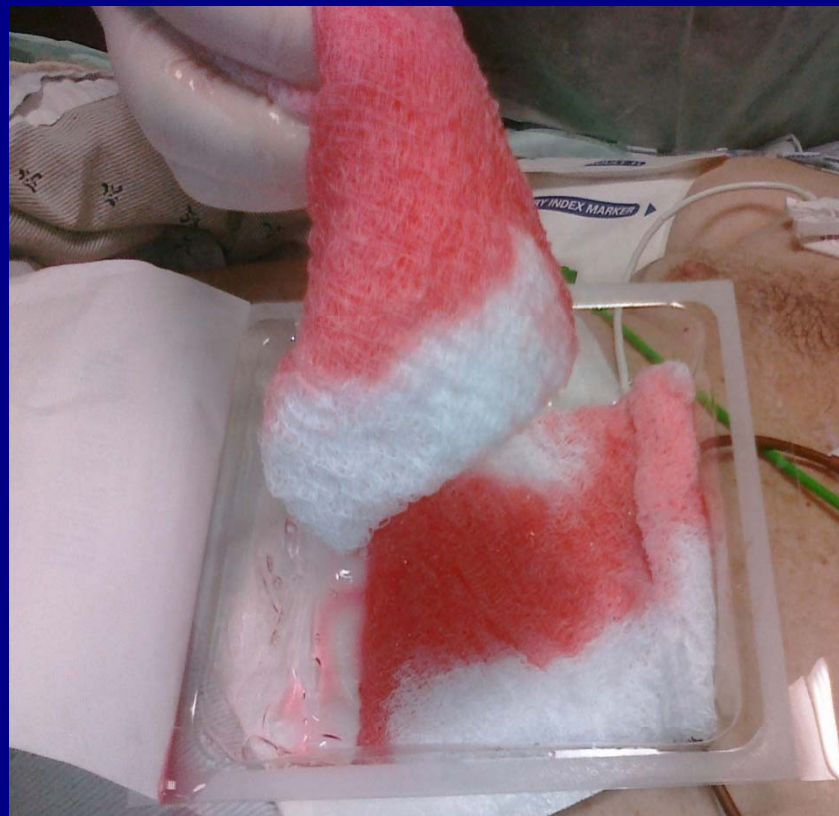


Palpate anterior neck & choose site



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 bed 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

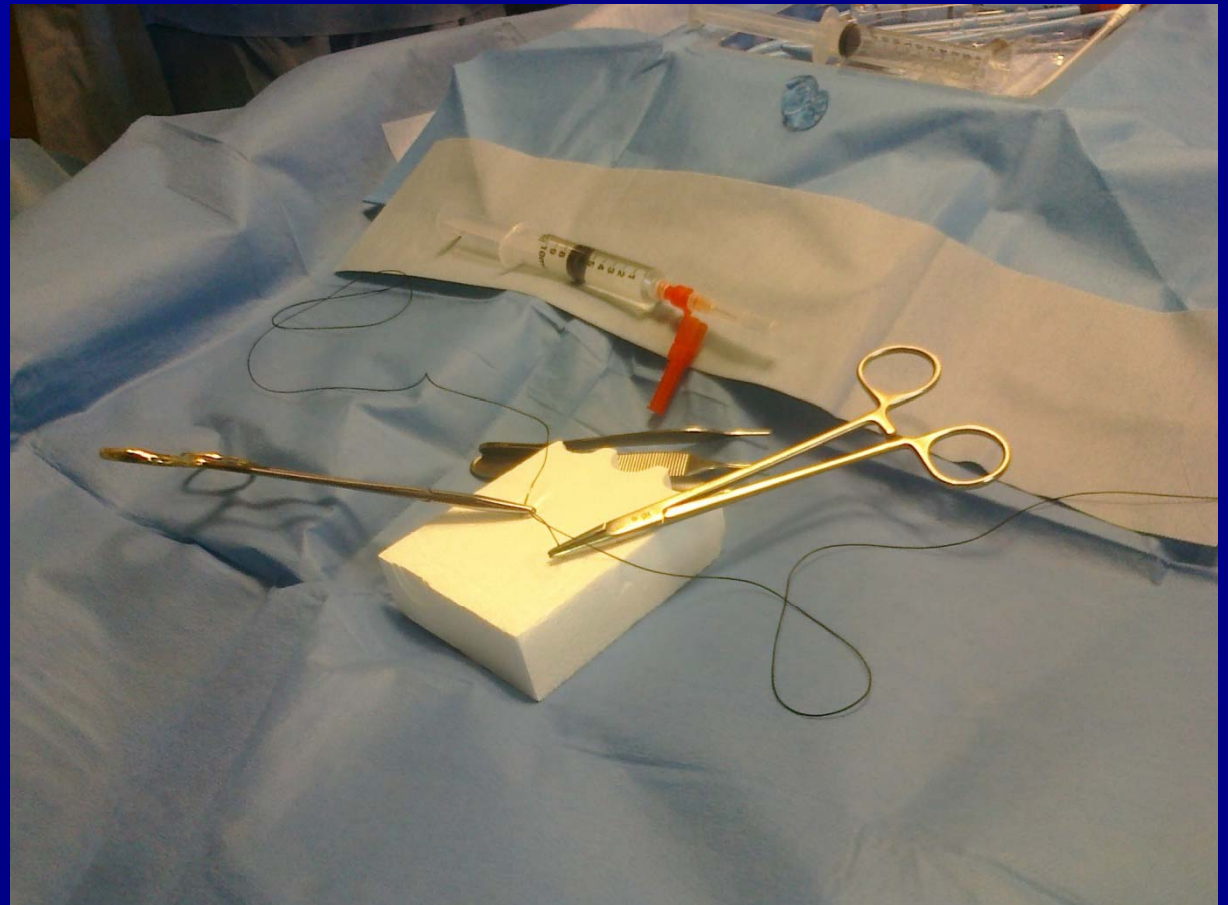


Setup

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.

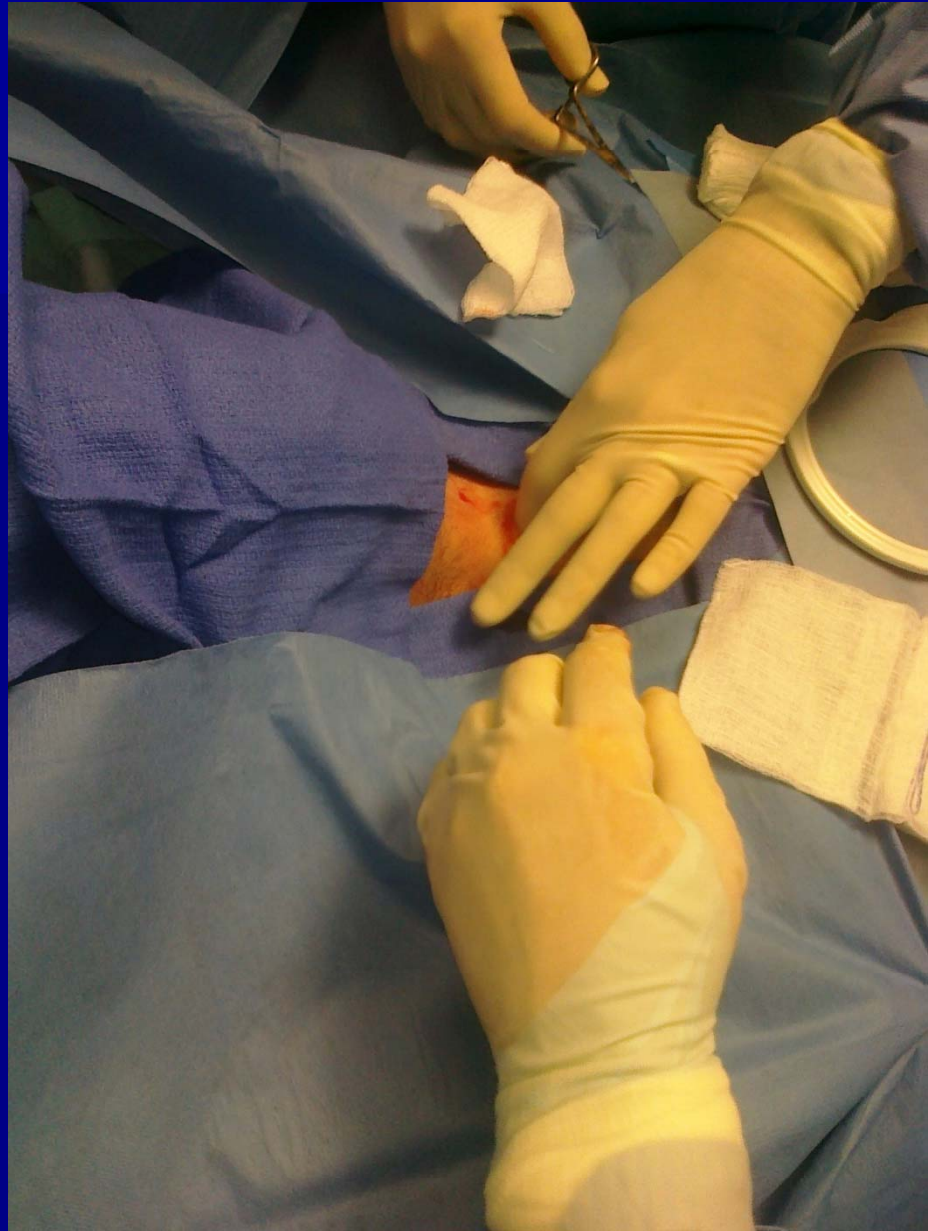
Length: about 2 cm

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:

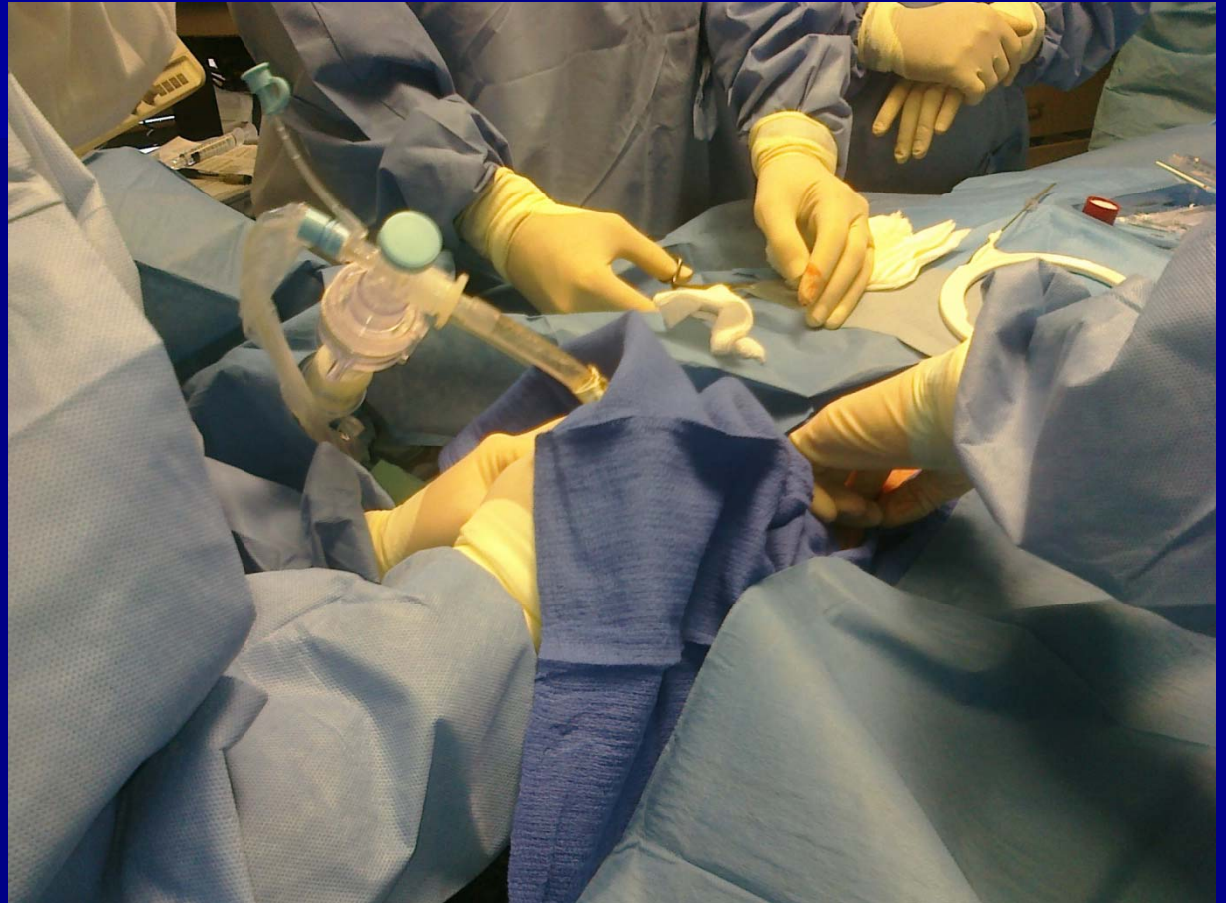
- Suction the endotracheal tube
- Suction oral, laryngeal pharynx
- Position ETT above the chosen insertion site confirmed by palpation.



Prepare the Airway

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

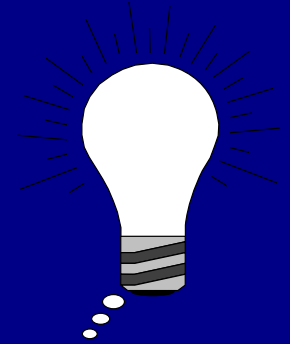
Give clear feedback regarding position and instructions to advance or withdraw.



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

Stablize 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
GUIDEWIRE, REMOVE IT AND THE
NEEDLE AND
START OVER!!!**

**Place small dilator over wire and
Dilate 3 times**

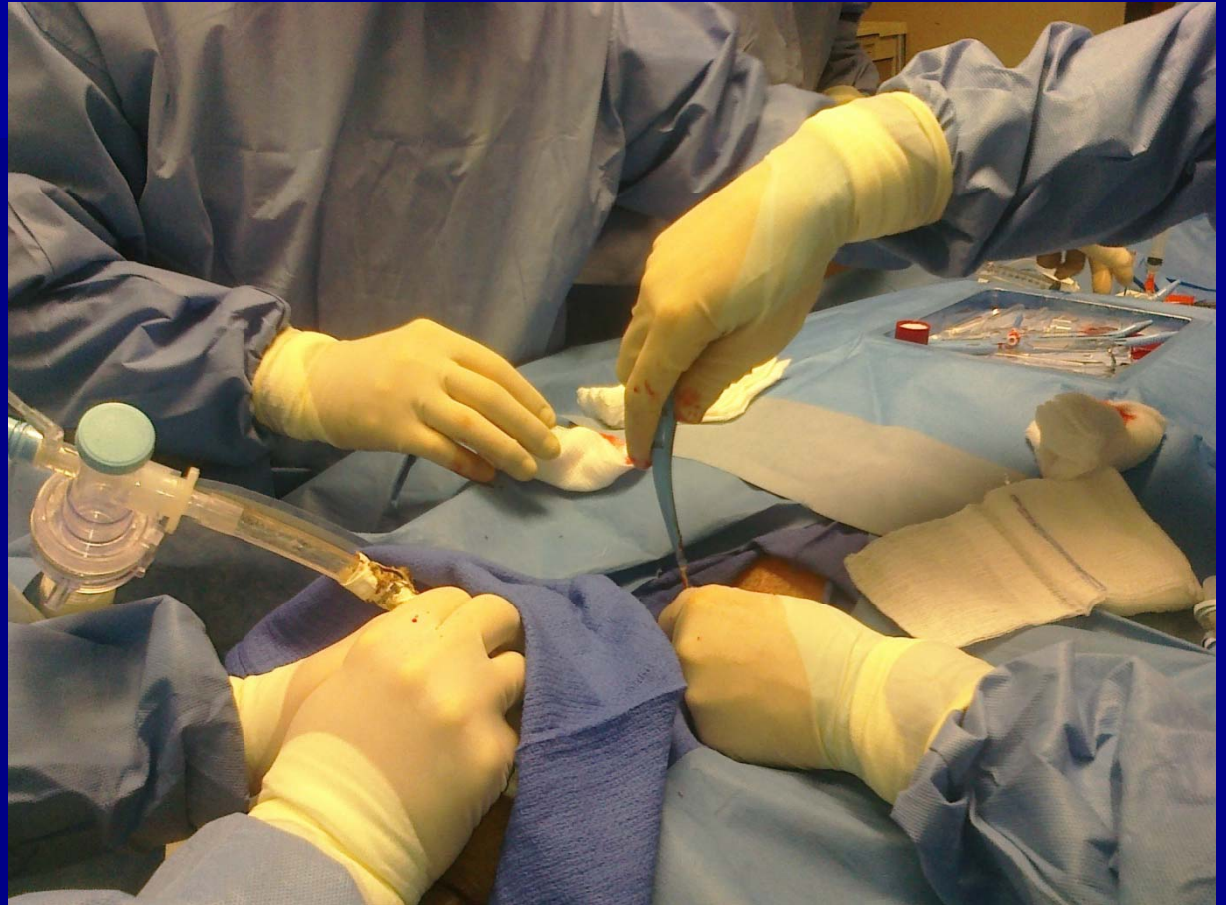


Place large dilator with inner guide over guidewire

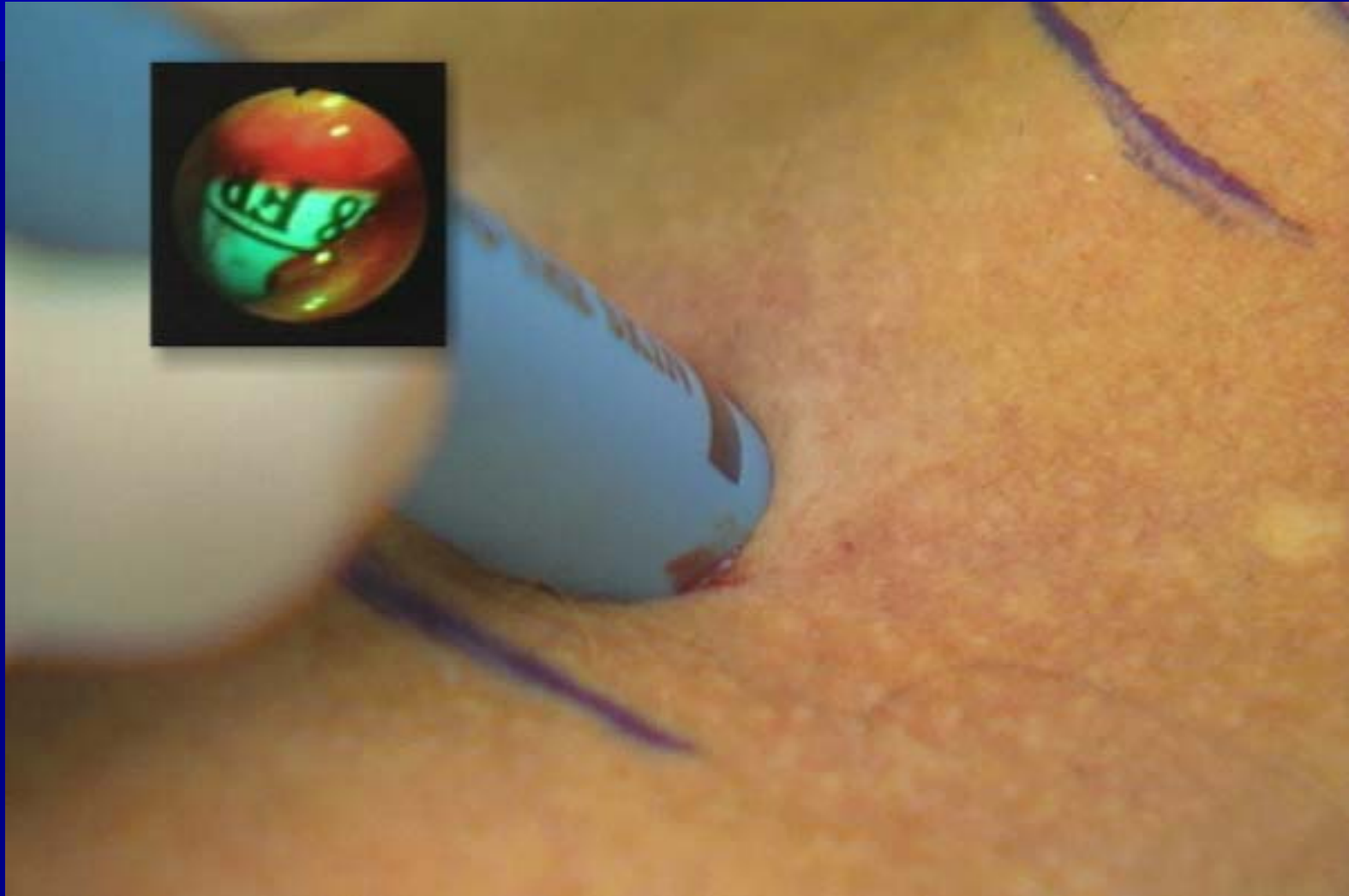


Serial Dilation

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

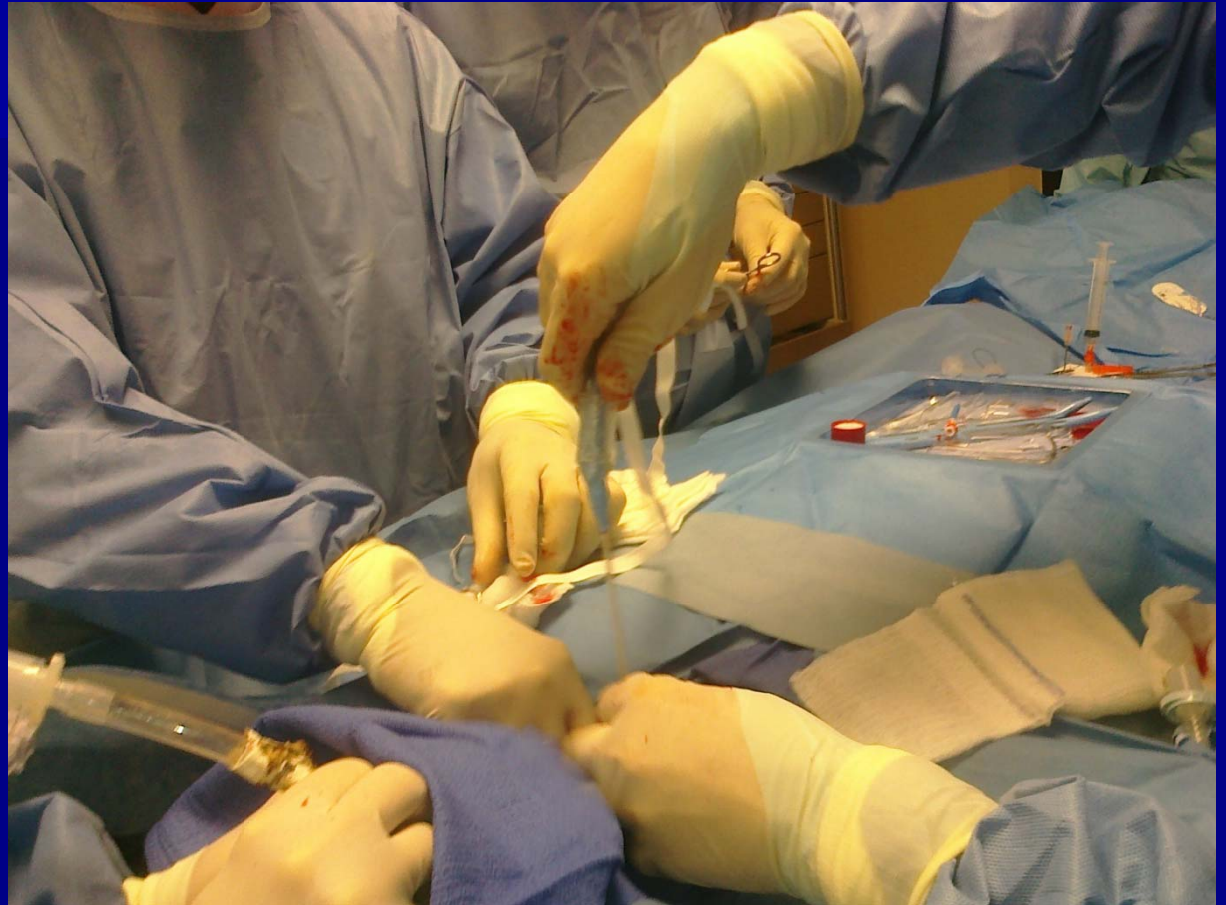


Place the Trach

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

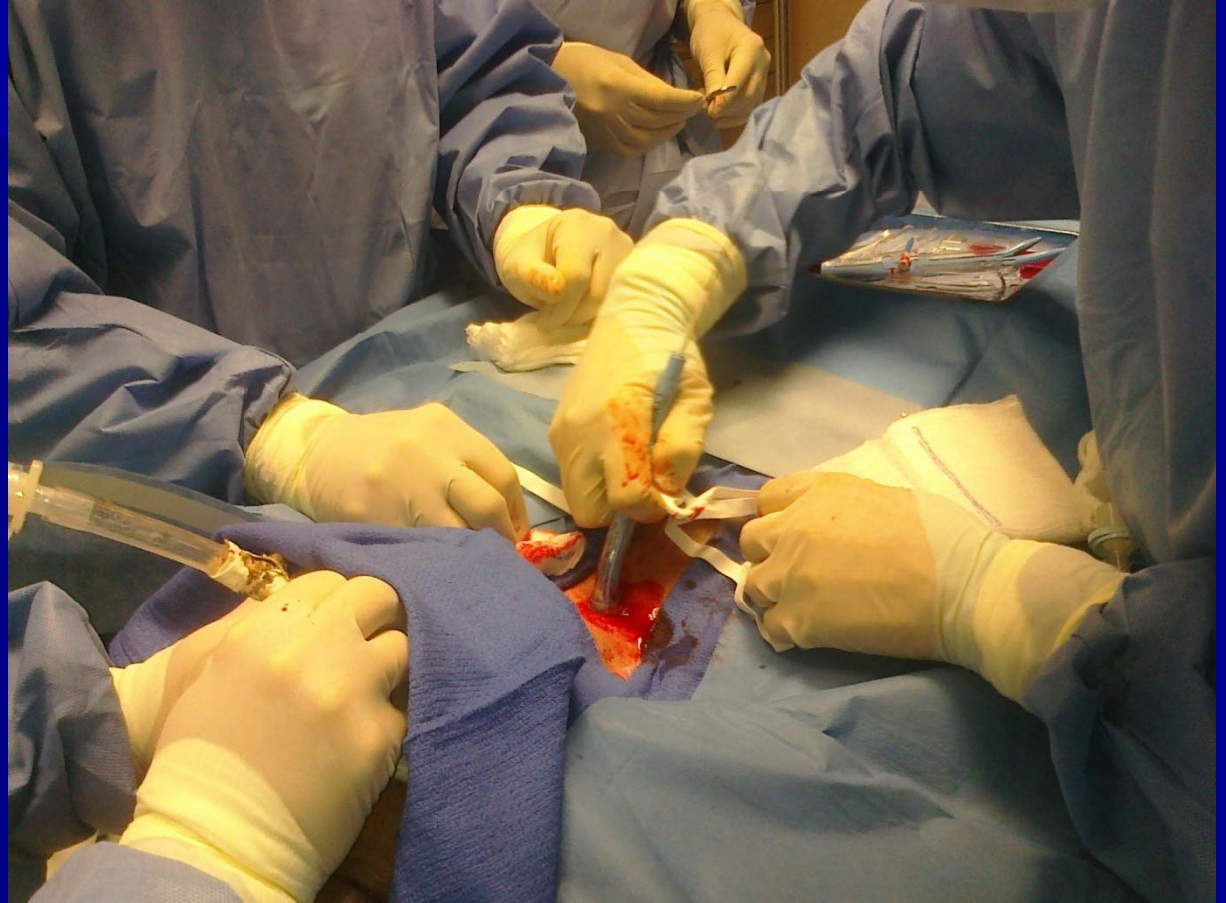
Use the curve of the trach to advance the tube over the wire.

You should feel 2 "pops" in.

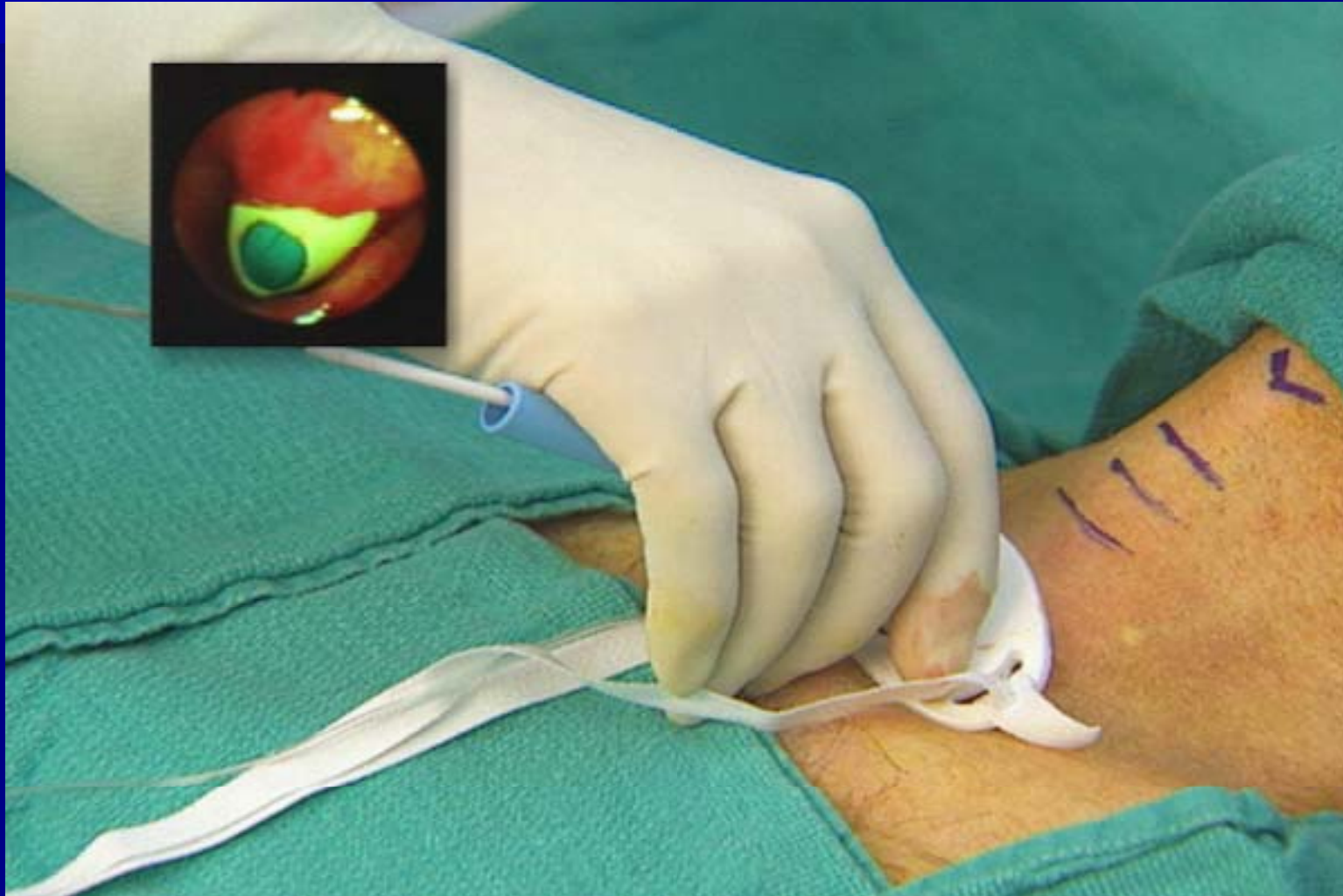


Advance Trach

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 ENDOTRACHEAL TUBE**

&

REMEMBER GOLDEN RULE #1

Suture tube in place AND secure with trach ties



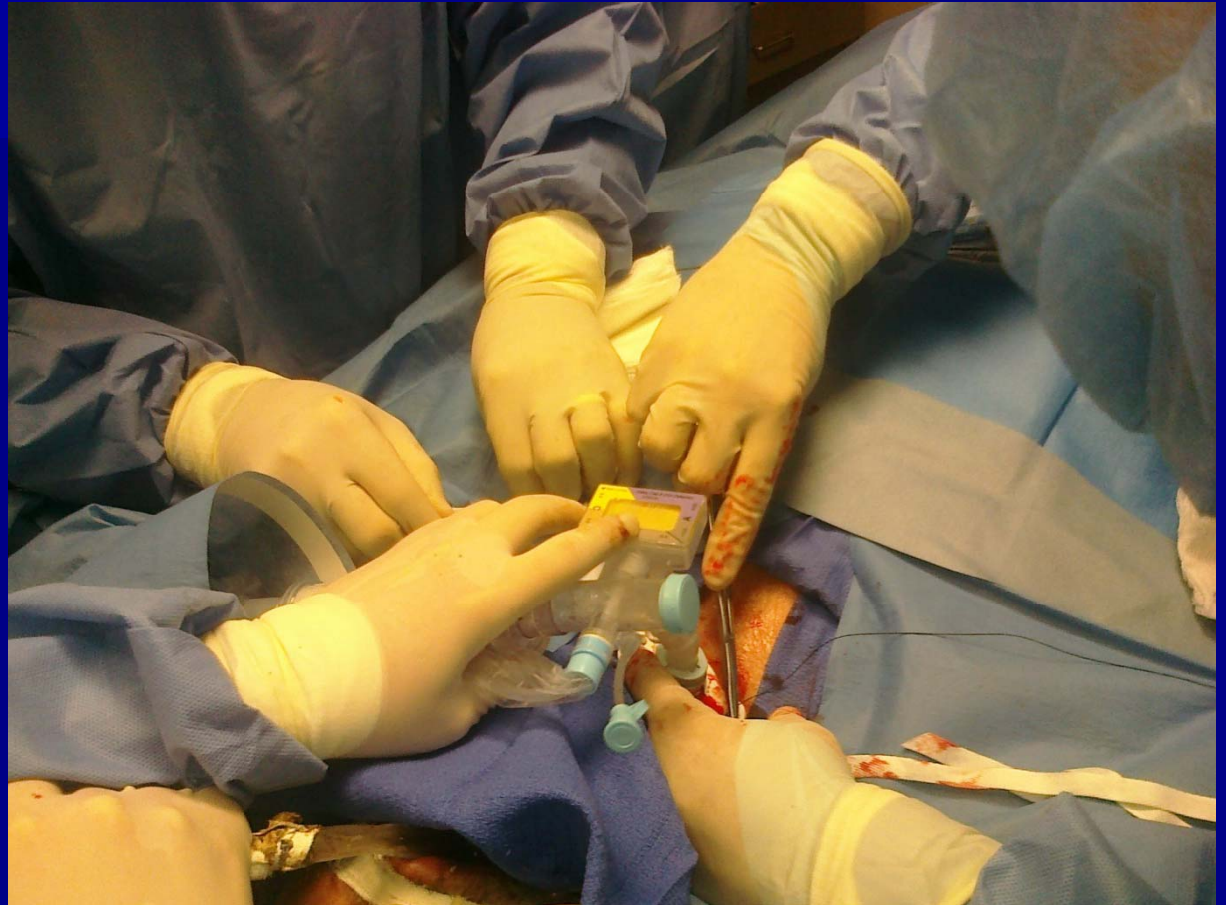
Secure Airway

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.

PROCEDURAL PROBLEMS (cont)

■ 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

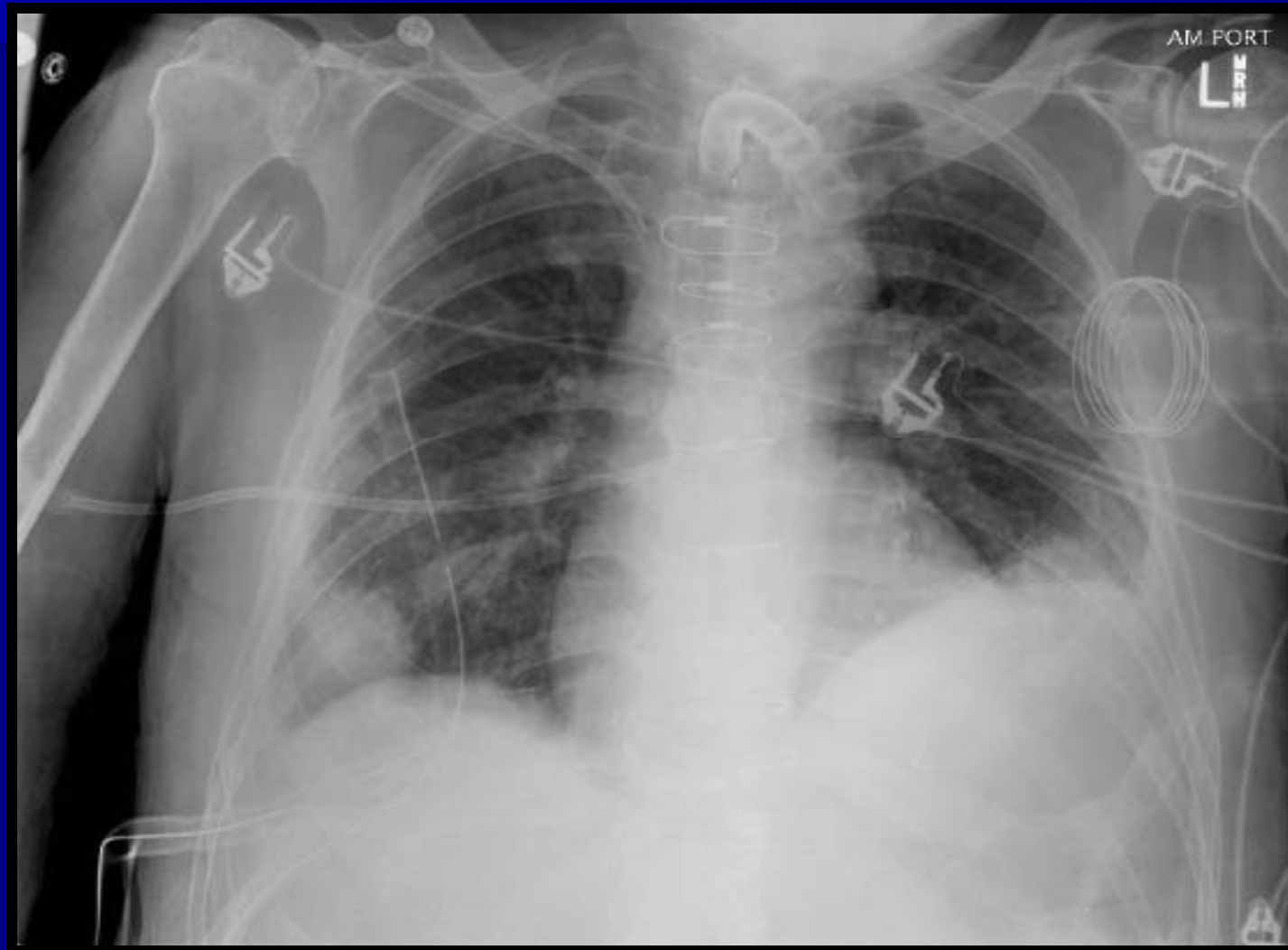
- 4 tracheostomy tube dislodgements
- all related to length of tracheostomy tube

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?

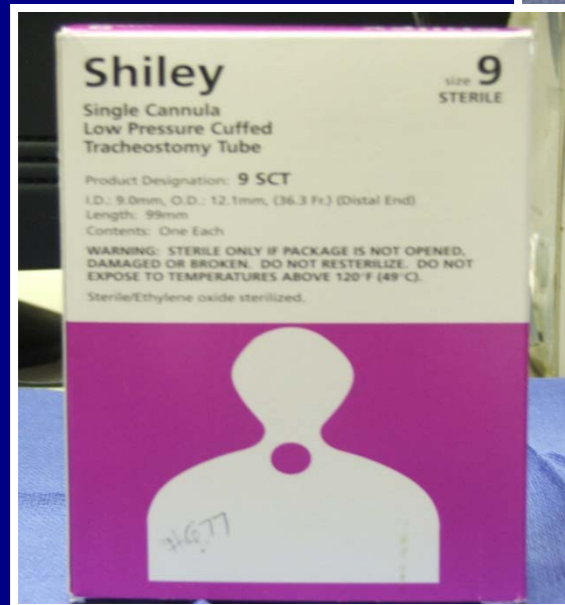
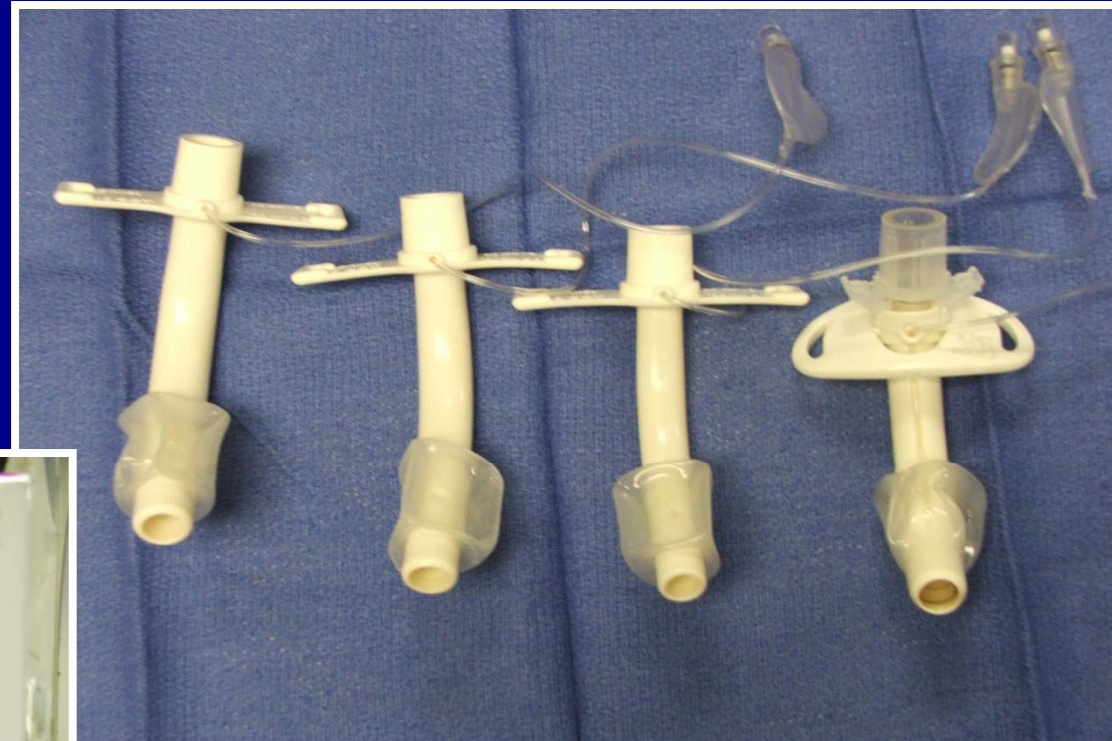


Effect of tracheostomy tube length



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