Emergent Cricothyroidotomy

INTRODUCTION
The emergent cricothyroidotomy is an uncommon ED procedure thanks to the advent of rescue airway devices (bougie, LMA, glidescope, etc). It is usually done under stressful, bloody and chaotic conditions so it is important that you are familiar with the anatomy and step of the procedure, so you can essentially do blind and by feel alone.

There are various ways to do a cricothyroidotomy but most importantly there are two main types: surgical (open) and needle (percutaneous). A needle cric is used in children under 8 years old with Percutaneous Translaryngeal Ventilation (PTLV). A surgical cric is contraindicated in children under 8 because the cricothyroid membrane is too small to insert a tracheostomy tube and thus the significant risk to the underlying structures.

GOALS OF THE PROCEDURE
- To secure a patent airway when all other techniques have failed

INDICATIONS
- Surgical
  - Can’t intubate or can’t ventilate – failed attempt at securing airway by less invasive means
  - Age >8 years old
- Needle
  - Age 1 to 8 years old with same indications as above

CONTRAINDICATIONS
- Surgical Cric—Age <8
- Tracheal transection, fracture or obstruction below cricothyroid membrane
- Ability to easily obtain an airway with less invasive measures

COMPLICATIONS
- Early:
  - Bleeding
  - Tube malposition
  - Bronchial intubation
  - Laryngotracheal injury
  - Tension Pneumothorax
  - Tube obstruction
- Late:
  - Voice changes, difficulty swallowing, infections, persistent stoma, subglottic or glottis stenosis
ANATOMY


EQUIPMENT

- **Surgical:**
  - #11 blade Scalpel
  - Tracheal hook
  - Trousseau dilator
  - Tracheostomy tube (Shiley Size 6) —OR— Cuffed 6.0 ET tube
  - +/- Bougie (recommended)

- **Needle:**
  - *To puncture the cricothyroid membrane:*
    - 14-gauge needle in angiocatheter
    - 5-mL syringe filled with saline
  - *For attachment to BVM:*
    - 3-mL plungerless syringe
    - 7.0 ETT connector
      - OR
    - Cut IV tubing
    - 2.5 ETT connector

STEPS

*The first step is always anticipating a difficult airway and the possibility of a cric…*

**Surgical (Traditional Technique)**

1. Prep the neck with betadine or chlorhexidine and if you have time inject the skin with Lido 1% w/ epinephrine to decrease bleeding
2. Extend the neck (if possible) to help identify and palpate your landmarks
3. Immobilize the larynx with your non-dominant hand and palpate the cricothyroid membrane with your index finger
4. Make a 3-5cm *vertical* midline incision through the skin and subcutaneous tissue over the cricothyroid membrane
5. Palpate the membrane after cutting to confirm the anatomy and then make a 1cm *horizontal* incision through the cricothyroid membrane
6. Leave your finger in the opening and insert the tracheal hook and lift cephalad on the inferior portion of the thyroid cartilage (ask someone to hold the hook)

7. Insert the Trousseau dilator in the opening of the membrane and spread in the vertical plane, rotate 90 degrees and spread again to allow an opening for the tracheostomy or ETT tube

8. Insert the tube between the blades of the dilator into the trachea and then remove the dilator

9. If using a 6.0 ETT inflate the balloon (be careful not to advance it too deep, you are already past the cords); if using the Tracheostomy tube, remove the stylet, insert the cannula and inflate the balloon

**Surgical using a Bougie (easier & quicker)**

1. Prepare neck and cut the cricothyroid membrane as described above

2. After cutting through the cricothyroid membrane insert your pinky finger into the opening and guide a bougie into the trachea

3. Pass as 6.0 ETT or Shiley over the bougie into the trachea, remove the bougie and inflate the balloon, DONE!

**Needle (Pediatric)**

1. Extend the neck to locate the cricothyroid membrane with your non-dominant hand

2. Attach a 14-gauge needle in angiocatheter to a 3- or 5-mL saline-filled syringe

3. Insert the needle through the skin, subcutaneous tissue, and cricothyroid membrane at 30-40° angle caudally

4. Aspirate as you advance the needle, air bubbles will be seen in the syringe when the trachea is entered

5. Once the trachea entered, advance catheter over the needle until the hub is flush with the skin

6. Remove needle and attach to oxygen supply

7. **THE EXTRAS – Attaching your catheter to O2 source (options below):**
   a. 7.0 ETT connector inserted into 3-mL plungerless syringe → attach to BVM
   b. Standard IV tubing attached directly to translaryngeal catheter with distal IV tubing attached to a 2.5 ETT connector → attached to BVM
c. Connect translaryngeal catheter to 3-way stop cock which connects to wall oxygen source, place finger over last opening to ventilate patient

OTHER VIDEO INSTRUCTION

- Surgical (traditional)
  - [https://www.youtube.com/watch?v=Kg14kdIycDE&spfreload=10](https://www.youtube.com/watch?v=Kg14kdIycDE&spfreload=10)
- Surgical using bougie
  - [https://www.youtube.com/watch?v=I6wodB2S0uc](https://www.youtube.com/watch?v=I6wodB2S0uc)
- Needle
  - [https://www.youtube.com/watch?v=Fq5YCpYTYUY](https://www.youtube.com/watch?v=Fq5YCpYTYUY)

DEEP DIVE

Further Reading

- Roberts & Hedges' Clinical Procedures in Emergency Medicine, 6th Edition, p 120-133

FOAM Resources

- EMCrit Blog
  - Procedure Videos
    - [http://emcrit.org/procedures/cricothyrotomy/](http://emcrit.org/procedures/cricothyrotomy/)
  - Podcast/Lecture- Cut to Air: Surgical Airway
  - Needle vs Knife
    - [http://emcrit.org/podcasts/cricothyrotomy-needle-or-knife/](http://emcrit.org/podcasts/cricothyrotomy-needle-or-knife/)
  - Bougie aided Cricothyroidotomy
- Life in the Fastlane
- Intubation and Post-intubation Checklist