

Cricothyrotomy

I. INDICATIONS

See Chapter 1

II. EQUIPMENT

A. Needle cricothyrotomy

1. 12- to 14-gauge catheter over needle or
2. Percutaneous cricothyrotomy kit (needle, guidewire, dilators, cricothyroid tube)

B. Surgical cricothyrotomy

1. Scalpel
2. Curved hemostat
3. 4- to 7-mm (inner diameter) tracheostomy or endotracheal tube

C. General

1. Connections for needle or tube (see below)
2. Qualitative or quantitative end-tidal CO₂ detector
3. Sterile syringes and infiltrating needles
4. Tape
5. Sterile 4 × 4 gauze sponges
6. Medication for local anesthesia
7. Sterile gloves, gown, mask, cap, eye protection, drapes for universal precautions
8. Povidone iodine
9. Supplemental oxygen (cannula, mask, other as appropriate)
10. Pulse oximeter
11. ECG monitor
12. Intravenous catheter, tubing, and fluid
13. Resuscitation cart

III. TECHNIQUE

A. Needle cricothyrotomy

1. Prepare patient
2. Assure intravenous access if time allows
3. Apply oxygen, monitor pulse oximeter and ECG
4. Position patient with head extended — may place roll behind shoulders if no cervical spine injury
5. Don mask and cap
6. Wash hands
7. Don gown and gloves
8. Create sterile field
9. Locate cricothyroid membrane (Fig. A2-1) and infiltrate local anesthetic
10. Attach sterile syringe to the catheter over needle
11. Insert catheter over needle into the cricothyroid membrane, directed caudally at an approximate 45° angle
12. Apply suction to syringe while advancing until syringe fills with air from trachea

13. Detach syringe from catheter over needle
14. Advance catheter into trachea, remove needle
15. Attach oxygen and secure catheter to skin
16. Method for insufflating oxygen through the tracheal catheter with a bag-valve device
 - a. Remove the plunger from a 3-mL syringe
 - b. Remove the 15-mm plastic adapter from the proximal end of a 7- or 7.5-mm (internal diameter) endotracheal tube
 - c. Insert the distal end of the 15-mm plastic adapter into the barrel of the 3-mL syringe (should fit tightly)
 - d. Attach the 3-mL syringe to the tracheal catheter
 - e. Attach the 15-mm plastic adapter to a resuscitation bag-valve system attached to oxygen source
 - f. Insufflate oxygen by compressing bag
 - g. Allow time for exhalation
 - h. Arrange for formal tracheostomy
17. Methods for jet ventilation of oxygen through the tracheal catheter
 - a. Jet ventilation may be accomplished with a transtracheal ventilation system attached to high-pressure oxygen (30 to 60 psi) source. Pressure and duration of insufflation are adjusted to effect adequate gas exchange. Remember that enough time must be allowed for exhalation.
 - b. If a premanufactured transtracheal ventilation system is not available, a system may be fashioned at the bedside by connecting the tracheal catheter to oxygen tubing via flowmeter at 15 L/min. Use a 3-way stopcock to connect the tubing to the tracheal catheter, a "Y" connector, or cut a hole in the side of the oxygen tubing. Insufflate gas by covering the open port of the stopcock, the Y connector, or the hole in the tubing with thumb. Adjust gas flow rate and duration of insufflation to effect adequate ventilation. Allow enough time for exhalation.
18. Percutaneous wire-guided cricothyrotomy kits are available commercially that allow insertion of an airway/dilator combination over a guidewire inserted through the cricothyroid catheter in a manner analogous to insertion of a central venous catheter.
19. These techniques are temporizing measures only, facilitating improved oxygenation but rarely providing for adequate CO₂ elimination. Therefore, these measures should be followed immediately by arrangements for formal tracheostomy.

B. Surgical cricothyrotomy

1. Prepare patient — may place roll behind shoulders if no cervical spine injury
2. Assure intravenous access
3. Apply oxygen, monitor pulse oximeter and ECG
4. Position patient
5. Don mask and cap
6. Wash hands
7. Don gown and gloves
8. Create sterile field
9. Locate cricothyroid membrane (Fig. A2-1) and infiltrate local anesthetic
10. Make a horizontal incision at the level of the cricothyroid membrane (Fig. A2-2)
11. Extend the incision through the cricothyroid membrane

12. Open the incision with a hemostat or the handle of the scalpel
13. Insert a 4- to 7-mm (internal diameter) tracheostomy or endotracheal tube (Fig. A2-2)
14. Secure the tube, and oxygenate and ventilate the patient with a bag-mask-valve system/mechanical ventilator
15. Make arrangements for formal tracheostomy when situation stabilizes

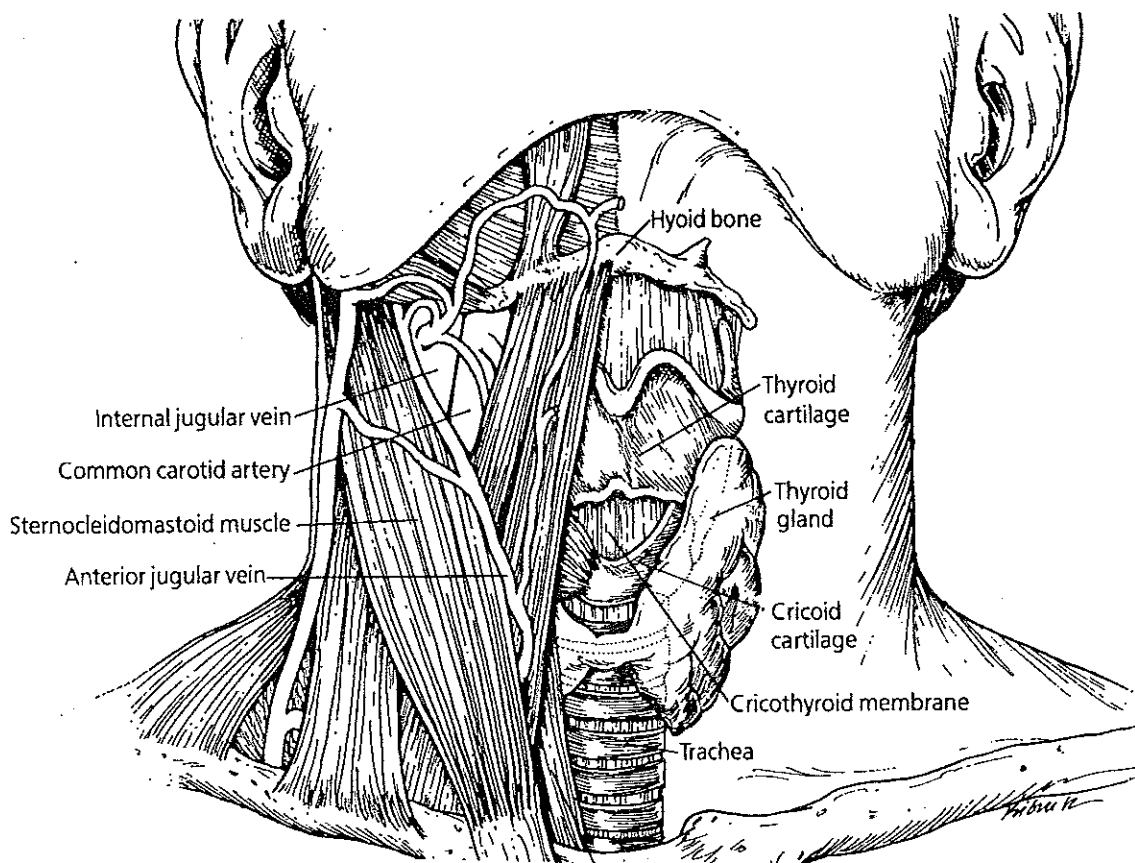


Figure A2-1. The cricothyroid membrane is located by palpation of the neck for the space between the thyroid cartilage and cricoid cartilage. Illustration © by Lydia Kibiuk and reproduced with permission from the artist and *The Journal of Critical Illness*.

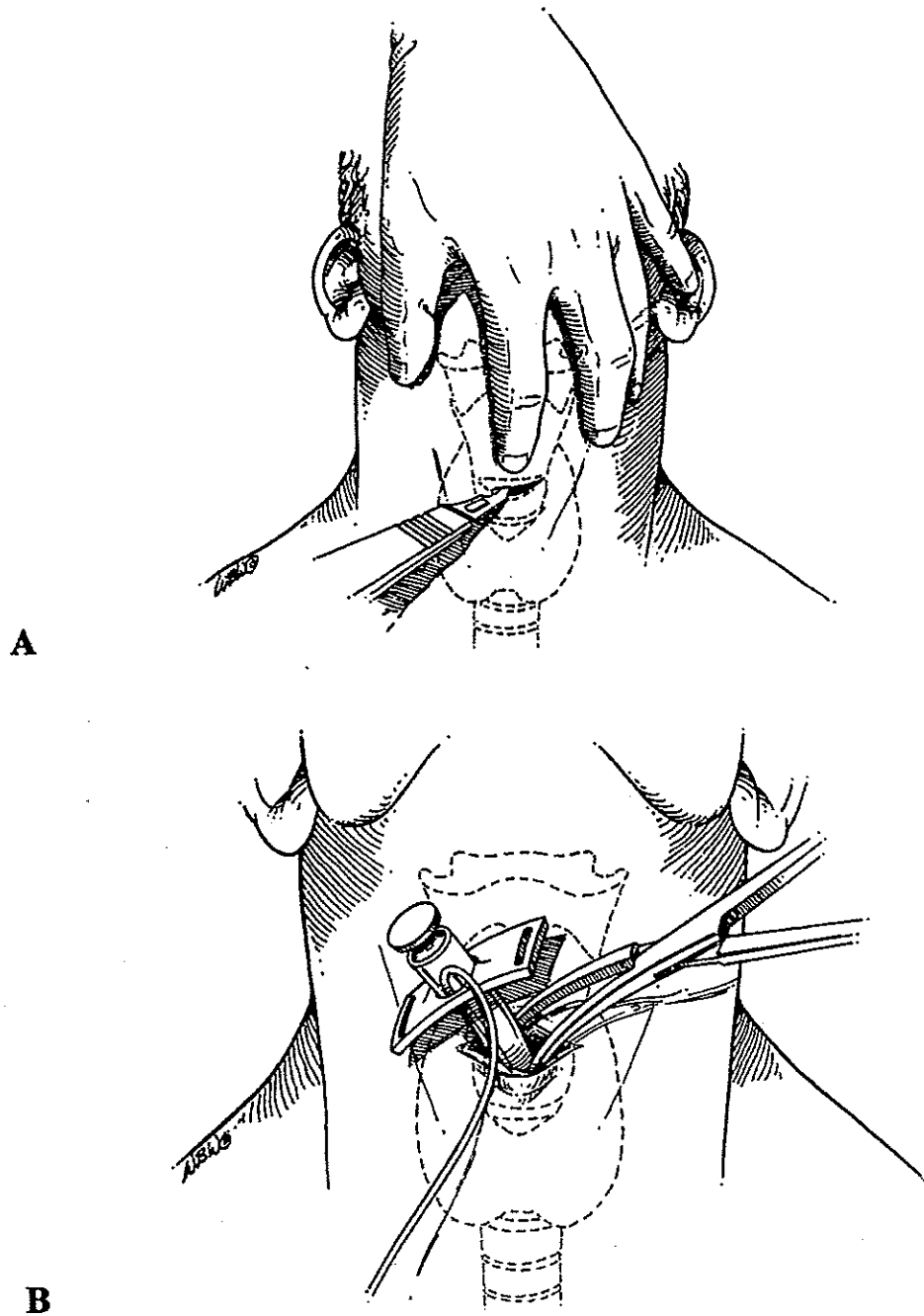


Figure A2-2. (A) A transverse incision is made through the skin over the cricothyroid membrane. (B) The incision is spread vertically to allow insertion of a tracheostomy tube. Illustration © by William B. Westwood and reproduced with permission from the artist and *The Journal of Critical Illness*.

IV. PEDIATRIC CONSIDERATIONS

- A. Needle cricothyrotomy is preferred to surgical cricothyrotomy in infants and young children because of the fragility of the laryngeal structures
- B. Cricothyrotomy is not advocated in infants and young children unless all other avenues of airway management have been explored, and the child is in extremis

V. PRECAUTIONS/COMPLICATIONS

- A. Subcutaneous and mediastinal emphysema
- B. False passage into pretracheal fascia
- C. Esophageal/posterior tracheal wall perforation or laceration
- D. Hemorrhage or hematoma formation
- E. Vocal cord paralysis or hoarseness
- F. Hypoxemia
- G. Aspiration
- H. Potential for inadequate ventilation (especially needle techniques)
- I. Proper patient positioning, a clear understanding of the anatomy, and strict adherence to the midline are essential to assure proper position of the airway
- J. The neck should only be extended if there is no cervical spine injury

SUGGESTED READINGS

- 1. Adjuncts for airway control, ventilation, and supplemental oxygen. *In: Textbook of Advanced Cardiac Life Support*. Dallas, American Heart Association, 1997, p 2-1
- 2. Brofeldt BT, Panacek EA, Richards JR: An easy cricothyrotomy approach: The rapid four-step technique. *Acad Emerg Med* 1996; 3:1060
- 3. Chan TC, Vilke GM, Bramwell KJ, et al: Comparison of wire-guided cricothyrotomy versus standard surgical cricothyrotomy technique. *J Emerg Med* 1999; 17:957
- 4. Committee on Trauma: Cricothyroidotomy. Advanced Trauma Life Support Program for Doctors. Chicago, American College of Surgeons, 1997, p 89
- 5. Patel RG, Norman JR: The technique of transtracheal ventilation. *J Crit Illness* 1996; 11:803
- 6. Tobias JD: Airway management for pediatric emergencies. *Pediatr Ann* 1996; 25:317-20, 323-328