PROCEDURE

1 Combitube Insertion AP and Removal

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PURPOSE: A Combitube may be used to provide an emergency airway during resuscitation of a profoundly unconscious patient who needs artificial ventilation when endotracheal intubation is not readily available or has failed in successfully establishing an airway.

PREREQUISITE NURSING KNOWLEDGE

- Anatomy and physiology of the upper airway should be understood.
- The Combitube does not require direct visualization of the airway for insertion and is inserted in a "blind" fashion, as an adjunct when endotracheal intubation attempts fail or trauma makes visualization of the airway difficult.[1,10] The Combitube (Fig. 1-1) is available in two sizes, determined by patient height.
  - The 37F size is used for patients 48 to 66 inches tall (122 to 168 cm).
  - Either size 37F or size 41F is applicable in patients 60 to 66 inches tall (152 to 168 cm).
  - For patients ≥66 inches (168 cm), the 41F size should be used.
- The Combitube has a unique design that includes:
  - A double-lumen, semirigid airway
    - Blue lumen opening to the perforations between the cuffs
    - White lumen opening distal to the distal cuff
    - Each lumen fitted with a 15-mm male adapter
  - Two cuffs for occlusion
    - Proximal cuff (85 mL or 100 mL, depending on tube size) to occlude the hypopharynx
    - Distal cuff (12 mL or 15 mL, depending on tube size) to occlude either the esophagus or the trachea
    - Each cuff connected to a pilot balloon and valve: blue for proximal (No. 1), white for distal (No. 2)
  - The two black lines located on the Combitube identify proper depth placement when aligned with the patient's teeth or gum line.
- The correct placement of a Combitube in the airway is as follows:
  - Esophageal insertion (Figs. 1-2 and 1-3), in which the distal cuff occludes the esophagus and the proximal balloon occludes the hypopharynx, allows ventilation via the blue lumen.
  - Tracheal insertion (Fig. 1-4), in which the distal cuff occludes the trachea and the proximal balloon occludes the hypopharynx, allows ventilation through the white lumen.
- Before the insertion of a Combitube, adequate ventilation of an unconscious patient with a mouth-to-mask or a bag-valve-mask device is necessary.
- In simulations, the Combitube has been successfully superior in situations of trismus, tongue edema, limited mobility of the cervical spine, or a combination of the above.[14]
- Use of the Combitube is contraindicated for airway management[10] in the following cases:
  - Patients with an intact gag reflex
  - Patients with known esophageal disease
  - Patients who have ingested caustic substances
  - Patients with a known or suspected foreign body in the hypopharynx
- The Combitube contains latex and may cause an allergic reaction in patients or in personnel who handle the device with sensitivity to latex.
- The Combitube is supplied either in a complete kit (with all of the necessary components for insertion), in soft or rigid packaging, or as a single individual device (without any of the necessary components for insertion). If the single individual device is used, additional components are necessary for insertion. See equipment list below.
- Initial and ongoing training is needed to maximize insertion success and minimize complications.[8]

AP This procedure should be performed only by physicians, advanced practice nurses, and other healthcare professionals (including critical care nurses) with additional knowledge, skills, and demonstrated competence per professional licensure or institutional standard.

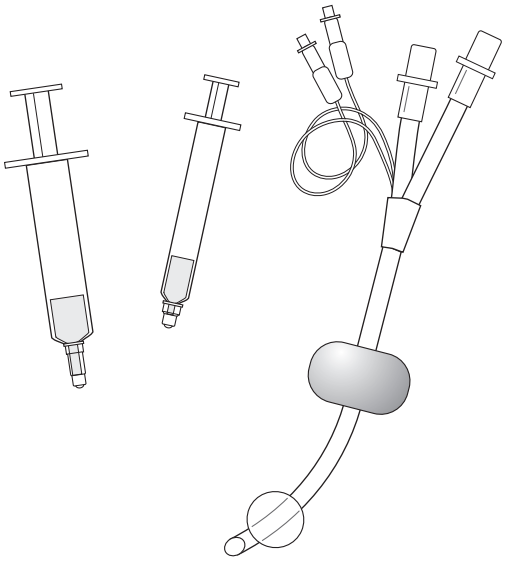

Figure 1-1 Components of the combitube.

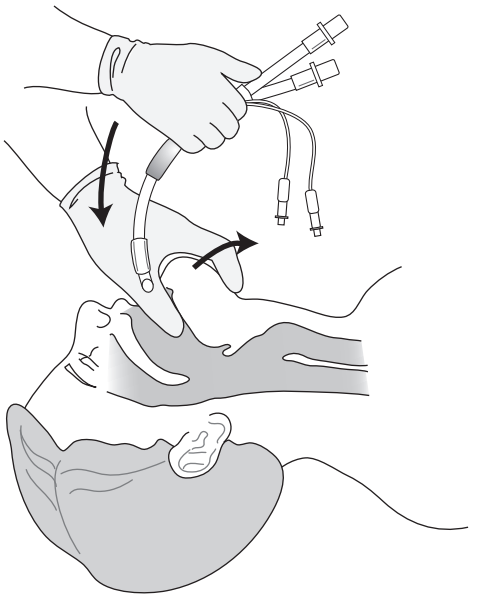

Figure 1-2 Esophageal insertion of a combitube.

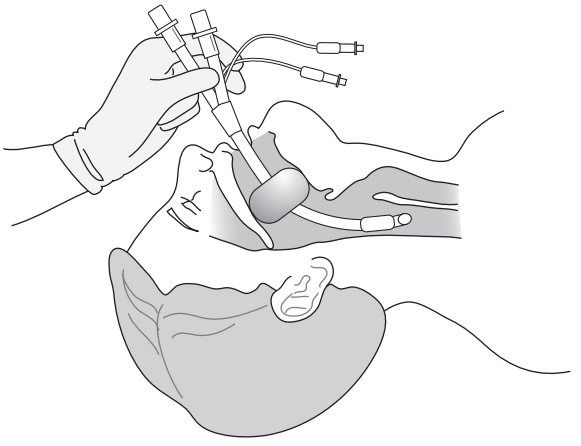

Figure 1-3 Combitube in esophageal position.

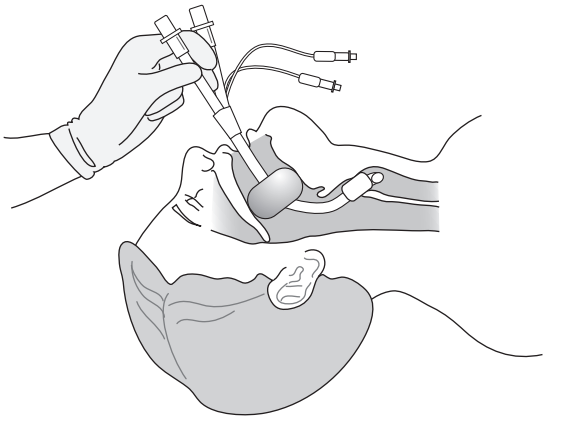

Figure 1-4 Combitube in tracheal position.

- Medications delivered via endotracheal tube cannot be used with a Combitube in the esophageal position. Medications may not reach the alveolar surfaces of the lung for absorption.
- The Combitube is intended for use up to 8 hours only.

EQUIPMENT

- Gloves, mask, gown, and eye protection
- Suction equipment (suction canister with control head, tracheal suction catheters, Yankauer suction tip)
- Combitube, of the appropriate size for the patient's height
- Large (100-mL) Luer-tip syringe
- Small (20-mL) Luer-tip syringe
- Water-soluble lubricant
- Oxygen source and tubing
- Mouth-to-mask or self-inflating manual resuscitation bag-valve-mask device and mask attached to a high-flow oxygen source
- Fluid deflector elbow
- Colormetric carbon dioxide (CO_2) device or end-tidal CO_2 detector with waveform capnography if available

PATIENT AND FAMILY EDUCATION

- If time allows, provide the family with information about the Combitube and the reason for insertion. ***Rationale:*** This information assists the family in understanding why the procedure is necessary and decreases their anxiety.

PATIENT ASSESSMENT AND PREPARATION

Patient Assessment

- Assess level of consciousness and responsiveness. ***Rationale:*** In an emergency situation, the Combitube should be inserted only into a patient who is profoundly unconscious, unresponsive, and unable to maintain adequate ventilation. Administration of neuromuscular blocking agents and sedation may be needed to ensure that the patient's gag reflex does not return while the Combitube is in place.[11]

- Assess history and patient information for possibility of esophageal disease or caustic substance ingestion. ***Rationale:*** A Combitube is contraindicated in patients with these conditions.[10]
- Assess patient's height. ***Rationale:*** This assessment allows the selection of an appropriately sized Combitube.
- Assess risk for hypertensive bleeding and take precautions if increased catecholamine stress response is likely. ***Rationale:*** Combitube insertion may cause pronounced catecholamine response.[6,12]

Patient Preparation

- Verify correct patient with two identifiers. ***Rationale:*** Prior to performing a procedure, the nurse should ensure the correct identification of the patient for the intended intervention.
- Ensure adequate ventilation and oxygenation with either a mouth-to-mask or a self-inflating manual resuscitation bag-valve-mask device. ***Rationale:*** The patient is nonresponsive and unable to maintain adequate ventilation without assisted ventilation before the Combitube insertion.
- Ensure that the suction equipment is assembled and in working order. ***Rationale:*** The patient may regurgitate during insertion or while the Combitube is in place and need oropharyngeal or tracheal suctioning or both.
- Perform a preprocedure verification and time out, if nonemergent. ***Rationale:*** Ensures patient safety.

Procedure for Combitube Insertion

Steps	Rationale	Special Considerations
1. HH		
2. PE		
3. Open the package and test the integrity of both cuffs. **(Level M*)**	Ensures that the device is not defective and will work as indicated.	
A. Pull the plunger back on the large syringe to the appropriate volume for the size of the tube and attach it to the proximal (blue) valve, marked "No. 1."	Readies the syringe for inflating the cuff.	Use 85-mL volume for the 37F size and 100-mL volume for the 41F size.
B. Inflate the proximal cuff with the appropriate volume and assess for leaks.	Ensures that the device is not defective and will work as indicated.	If a leak is found, discard the device and secure another.
C. Actively deflate the proximal cuff, leaving the syringe attached to the valve.	Provides for smoother insertion and readies the syringe for inflation after insertion.	
D. Pull the plunger back on the small syringe to the appropriate volume for the size of the tube and attach it to the distal (white) valve, marked "No. 2."	Readies the syringe for inflating the cuff.	Use 12-mL volume for the 37F size and 15-mL volume for the 41F size.
E. Inflate the distal cuff with the appropriate volume and assess for leaks.	Ensures that the device is not defective and will work as indicated.	If a leak is found, discard the device and secure another.
F. Actively deflate the distal cuff, leaving the syringe attached to the valve.	Provides for smoother insertion and readies the syringe for inflation after insertion.	
4. Lubricate the device with water-soluble lubricant. **(Level M)**	Facilitates and eases insertion.	
5. Attach a fluid deflector to the clear lumen marked "No. 2." **(Level M)**	Diverts any fluid that may be regurgitated through the tube during insertion away from the person inserting the device.	A fluid deflector is included in the kits but not in the single individual devices.

*Level M: Manufacturer's recommendations only.

Procedure continues on following page

Procedure for Combitube Insertion—*Continued*

Steps	Rationale	Special Considerations
6. Grasp the patient's jaw with one hand and pull up (or forward if the patient is in a sitting position), maintaining the head in a neutral position (see Fig. 1-4).[11] **(Level M*)**	Pulls the tongue forward and away from the hypopharynx.	With facial trauma, assess for the presence of broken teeth (real or artificial) and remove loose fragments. Maintain cervical spine precautions with suspected or known spine trauma. A Combitube used during airway management causes cervical spine movement less or equal to conventional laryngoscopes.[9] Use extreme caution to avoid puncturing the balloons during insertion.
7. Grasp the Combitube in the other hand so that it curves toward the patient's feet. **(Level M)**	Places the Combitube in the appropriate position for insertion.	
8. Insert the tip of the Combitube into the patient's mouth and advance it in a downward curving motion, maintaining a midline position, until the teeth or gum line is between the two black marks on the device. **(Level M)**	Allows the Combitube to follow the patient's hypopharynx until it is in the correct position.	***Do not force the Combitube.*** If it does not easily advance, attempt to redirect or remove and reinsert.
9. Inflate the proximal cuff with the appropriate volume, using the blue valve, marked "No. 1." **(Level M)**	Inflates and seats the proximal cuff into the posterior hypopharynx and seals it.	Use 85-mL volume for the 37F size and 100-mL volume for the 41F size. Significant resistance is felt as the cuff is inflated. Keep the syringe plunger depressed while removing it from the valve to prevent air escaping from the cuff.[4] If an air leak develops, add 10 mL of air at a time until the leak seals. Volumes of 150 mL may be needed for some individuals.[4]
10. Inflate the distal cuff with the appropriate volume, using the white valve, marked "No. 2." **(Level M)**	Inflates the distal cuff and seals the esophagus (or trachea) depending on location. Both locations allow the establishment of an effective airway.	Use 12-mL volume for the 37F size and 15-mL volume for the 41F size.
11. Connect the self-inflating manual resuscitation bag-valve device to the 15-mm adapter on the blue lumen, marked "No. 1," and ventilate. **(Level M)**	Most of the time, the distal balloon is in the esophagus.[2] With both cuffs inflated, the only place the ventilation can go is into the trachea.	

*Level M: Manufacturer's recommendations only.

Procedure for Combitube Insertion—*Continued*

Steps	Rationale	Special Considerations
12. Assess for tube placement. **(Level M*)**	Determines placement of the tube and which lumen should be used to ventilate.	
A. Assess for gurgling over the epigastrium, chest rise and fall, and breath sounds in the lung fields with each ventilation.	If the distal cuff is in the esophagus, no gurgling is heard over the epigastrium and the ventilation expands the lungs, causing the chest to rise and fall and breath sounds to be heard over the lung fields. **Go to Step 13.** If the distal cuff is in the trachea, gurgling is heard over the epigastrium and no rise and fall of the chest is seen or breath sounds heard over the lung fields. **Go to Step 12B.** If no gurgling or breath sounds are noted with ventilation, the Combitube may have been advanced too far into the esophagus, blocking the perforations from the blue lumen. **Go to Step 12C.**	Listening over the epigastrium initially provides rapid determination that the ventilation is going into the esophagus.[1] When assessing for the presence of breath sounds, always consider the possibility of a pneumothorax. This condition can change the breath sounds presentation and lead the inserter to believe that the Combitube is misplaced.
B. Immediately switch the self-inflating manual resuscitation bag-valve device to the clear lumen, marked "No. 2," and attempt to ventilate, assessing for gurgling over the epigastrium, chest rise and fall, and breath sounds in the lung fields with ventilation.	If the distal cuff is in the trachea, no gurgling is heard over the epigastrium and the ventilation expands the lungs, causing the chest to rise and fall and breath sounds to be heard over the lung fields. **Go to Step 13.**	Listening over the epigastrium initially provides rapid determination that the ventilation is going into the esophagus.[1] When assessing for the presence of breath sounds, always consider the possibility of a pneumothorax. This condition can change the breath sounds presentation and lead the inserter to believe that the Combitube is misplaced.
C. Deflate the proximal cuff, using a syringe on the blue valve, marked "No. 1," withdraw the Combitube approximately 2 to 3 cm, and reinflate the "No. 1" cuff.	Allows for the repositioning of the Combitube so that the soft tissue of esophagus no longer occludes the blue lumen perforations. **Return to Step 9.**	If repositioning of the Combitube does not establish an effective airway, remove the device and establish an airway with alternative means.
13. Secure the Combitube with either tape or a manufactured tube holder (see Fig. 2-10).	Prevents the possibility of dislodgement.[3]	
14. Further assess device placement with an end-tidal carbon dioxide device,[2,13] or an esophageal detector device.[2,13] **(Level E*)**	Confirms proper placement with two additional methods.[4,5]	
15. Continue ventilation through whichever lumen provides the airway. **(Level M)**	Adequate ventilation can be achieved with the distal cuff of the Combitube in either the esophagus or the trachea.	

*Level E: Multiple case reports, theory-based evidence from expert opinions, or peer-reviewed professional organizational standards without clinical studies to support recommendations.
*Level M: Manufacturer's recommendations only.

Procedure continues on following page

Procedure for Combitube Insertion—*Continued*

Steps	Rationale	Special Considerations
16. Remove and discard PE.		
17. HH		
18. Document the procedure in the patient's record.		

Procedure for Combitube Removal

Steps	Rationale	Special Considerations
1. HH		
2. PE		
3. To remove the Combitube:	Removal is indicated within 8 hours of insertion or when skilled personnel can manage the patient's airway.	A fiber-optic scope may be used to replace a Combitube with an endotracheal tube. If the Combitube has been placed in the trachea, cricoid pressure should be established and maintained until the new airway is established.
A. Decompress the stomach.	Removes any contents from the stomach, which makes regurgitation less likely with removal of the device.	If the Combitube is placed in the esophagus, a small suction catheter may be inserted through the white "No. 2" lumen to decompress the stomach.
B. Attach a 100-mL syringe to the blue valve, marked "No. 1," and deflate the cuff.	Deflates the proximal cuff and allows suctioning of the hypopharynx.	
C. Suction the hypopharynx.	Removes secretions that may have accumulated in the hypopharynx.	
D. Attach a 20-mL syringe to the white valve, marked "No. 2," and deflate the cuff.	Deflates the distal cuff and allows the Combitube to be withdrawn.	
E. Withdraw the Combitube from the airway, and administer supplemental oxygen.	Allows the patient to breathe on his or her own and supplies supplemental oxygen to counter any hypoxia.	
4. Remove and discard PE.		
5. HH		
6. Document the procedure in the patient's record.		

Expected Outcomes

- Establishment of an effective airway in an emergency situation
- Maintenance of adequate ventilation and oxygenation
- Recovery of spontaneous ventilation

Unexpected Outcomes

- Complications from use of the Combitube related to insertion technique or excessive cuff pressures
- Sore throat[7]
- Dysphagia[7]
- Bleeding[15]
- Pharyngeal perforation[15]
- Esophageal lacerations[15]
- Esophageal rupture[15]
- Improper placement, resulting in hypoventilation

Patient Monitoring and Care

Steps	Rationale	Reportable Conditions
		These conditions should be reported if they persist despite nursing interventions.
1. Monitor ventilation effectiveness while the Combitube is in place by monitoring: A. Difficulty of ventilation. B. Spo_2. C. $Petco_2$.	Determines that the Combitube is functioning correctly and providing adequate ventilation and oxygenation.	• Increased difficulty in ventilation • Unexplained decreases in oxygen saturation (Spo_2) or end-tidal carbon dioxide ($Petco_2$) levels
2. Monitor for return of spontaneous attempts at breathing.	May indicate need either to remove the device or use medications (sedatives or nondepolarizing neuromuscular blockade) to prevent the gag reflex.[7]	

Documentation

Documentation should include the following:

- Assessment findings that indicate the need to insert a Combitube
- Confirmation of adequacy of ventilation, with auscultation of gastric area and lung fields with $Petco_2$
- Any difficulties with placement of the Combitube
- $Petco_2$ levels
- Need for sedation or neuromuscular blockade or both
- Assessment findings on removal of the Combitube, including work of breathing, breath sounds, and Spo_2 levels
- Assessment findings after insertion of the Combitube that indicate which lumen ventilates the patient
- Secondary confirmation of adequacy of ventilation, or an esophageal detection device, in conjunction with Spo_2 levels with ventilation
- Ongoing monitoring of difficulty or ease of ventilation
- Spo_2 levels
- Assessment findings that indicate the need to remove the Combitube or replace it with an endotracheal tube

References and Additional Readings

For a complete list of references and additional readings for this procedure, scan this QR code with any freely available smartphone code reader app, or visit http://booksite.elsevier.com/9780323376624.