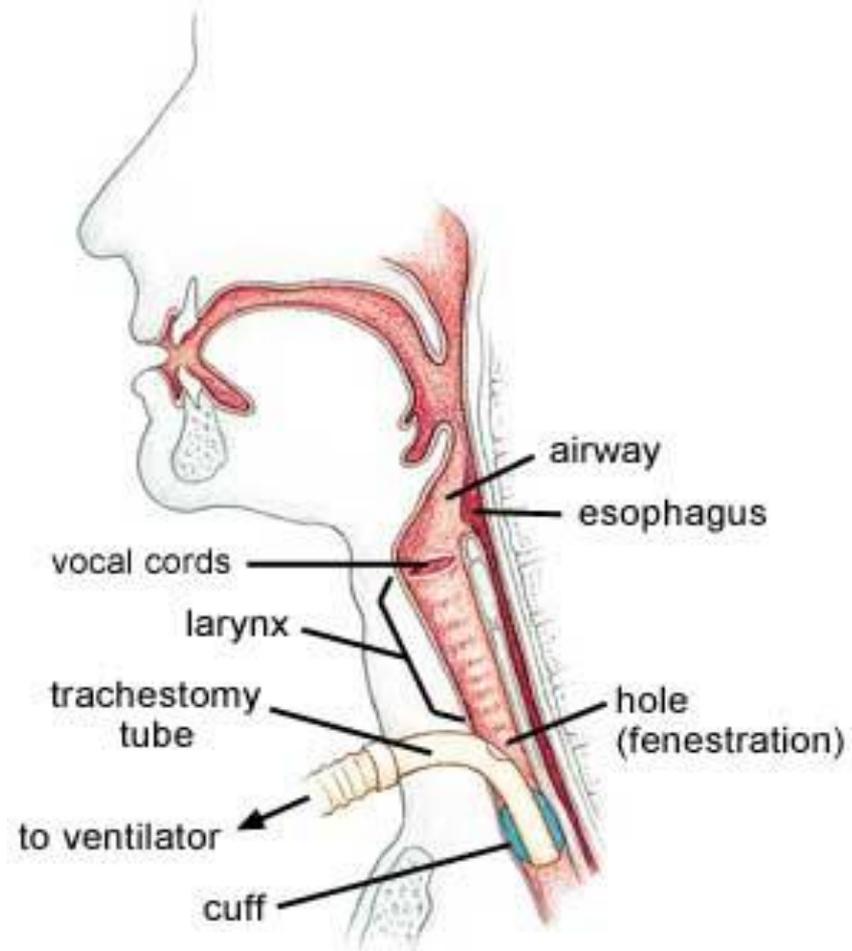


# Tracheostomy



# Anatomy

- It is a mobile cartilagenous & membranous tube .
- It begins as a continuation of the larynx at the *lower border of the cricoid cartilage at the level of the 6<sup>th</sup> cervical vertebra* , it descends in the midline of the neck ...
- In the thorax it *ends at the carina* by dividing into right & left main bronchi *at the level of the sternal angle opposite to the disc between T4/5*
- So it extend from **C6-T4/5**.

## Cont...

In adult , the trachea is about (11.5cm) in length and nearly (2.5cm) in diameter.

- In infants , the trachea is about (4 to 5 cm) in length and may be as small as 3 mm in diameter
- The blood supply of the trachea is from the **inferior thyroid vessels(upper2/3)** & **bronchial arteries(lower1/3)** , and its lymphatic drainage is to **paratracheal , pretrachial , deep cervical lymph nodes.**

# Relations

- Lying partly in the neck and partly in the thorax, its **Cervical** relations are:
  - **Anteriorly**— the isthmus of thyroid gland, inferior thyroid veins, sternohyoid and sternothyroid muscles.
  - **Laterally** —the lobes of thyroid gland and the common carotid artery.
  - **Posteriorly** —the oesophagus with the recurrent laryngeal nerve lying in the groove between oesophagus and trachea.

# Cont...

- The patency of the trachea is maintained by a series of *15-20 U-shaped cartilages*.

# *Tracheostomy*

- is an operative procedure that creates a **surgical airway in the cervical trachea just below the larynx** through which an indwelling tube is placed thus an artificial airway is created , it provides an air passage to help the pt breathe when the usual route for breathing is obstructed or impaired.

# Types

(Temporary Vs. permanent )

## Temporary tracheostomy:

This can be removed when the patient recovers.

→the upper airway will remain connected to the lower airway if the tracheostomy tube were to be dislodged

# Types

(Temporary Vs. permanent )

## Permanent tracheostomy:

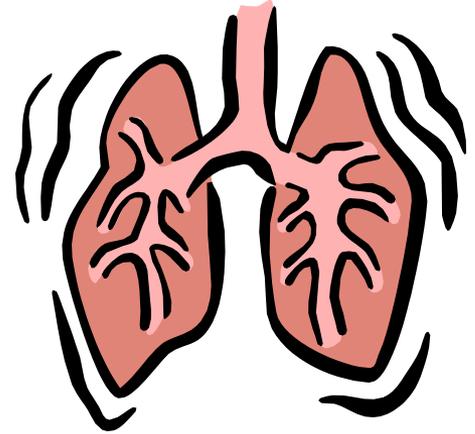
- This stoma is kept open by the rigidity of the tracheal cartilage. The patient will breathe through this stoma **for the remainder of his/her life.**
  - As a result, there is **no connection** between the nasal passages and the trachea.
- It is most often performed in patients who have had difficulty weaning off a ventilator, followed by those who have suffered trauma or a catastrophic neurologic insult

One of the most indications for permanent tracheostomy is **total laryngectomy**

# *Indications*

- ✓ Acute indications.
- ✓ Chronic indications.
- ✓ Elective setting.

# *Acute indications*



- ✓ Maxillofacial injuries.
- ✓ Poisoning
- ✓ Upper airway obstruction.
- ✓ acute angioedema and inflammation of the head and neck

# Upper Airway Obstruction

Cause	Examples
Congenital	Subglottic or upper tracheal stenosis, laryngeal web, laryngeal and vallecular cysts, tracheo-oesophageal anomalies or haemangioma of the larynx.
Infective	Acute epiglottitis, laryngotracheobronchitis, diphtheria or Ludwig's angina.
Malignancy	Advanced tumours of larynx, tongue, pharynx or upper trachea presenting with stridor.
Trauma	Gunshot and knife wounds to the neck, inhalation of steam or smoke, swallowing of corrosive fluid.
Vocal cord paralysis	Post-op complication of thyroidectomy, cardiac or oesophageal surgery, bulbar palsy.
Foreign body	Swallowed or inhaled object lodged in upper airway causing stridor.

# *Chronic indications*

## *1. Pulmonary Ventilation*

- *Tracheostomy should be performed in a patient still requiring ventilation through an endotracheal tube for more than tow week.*
- *Tetanus; Brain-stem stroke , Coma*

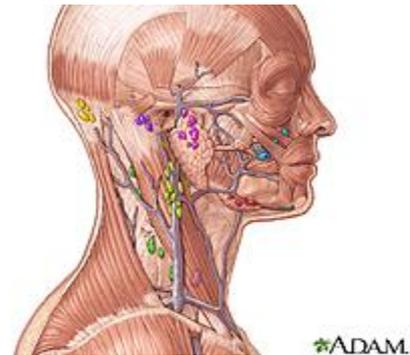
## Cont...

### 2. Pulmonary Toilet

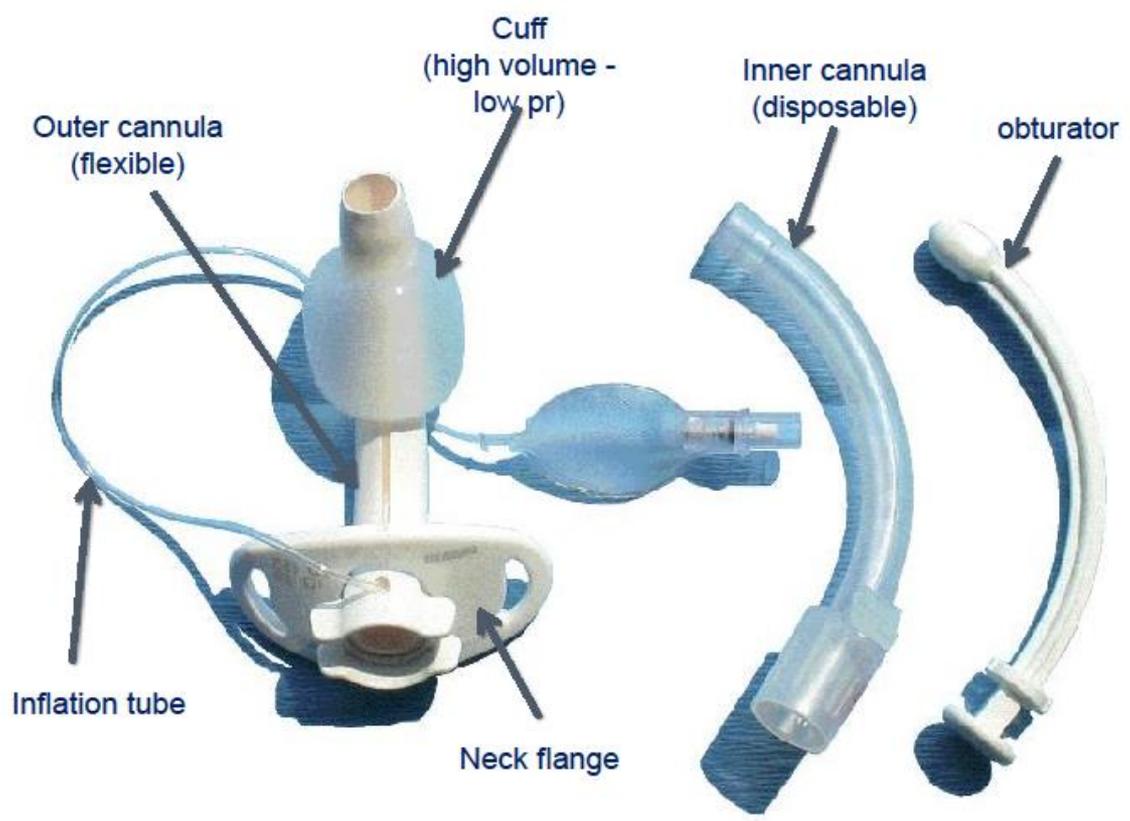
- Those who cannot cough and clear their chest.
- Prevent aspiration by low pressure high volume cuff tracheostomy tube.
- Any condition causing pharyngeal or laryngeal incompetence may allow aspiration of food, saliva, blood or gastric contents.
- In respiratory failure due to central depression of res. Center (Polyneuritis (e.g. Guillain–Barré syndrome); Bulbar poliomyelitis; Multiple sclerosis;)
- Myasthenia gravis

# *Elective setting*

- ❖ In head and neck operations.



# Tracheostomy tube



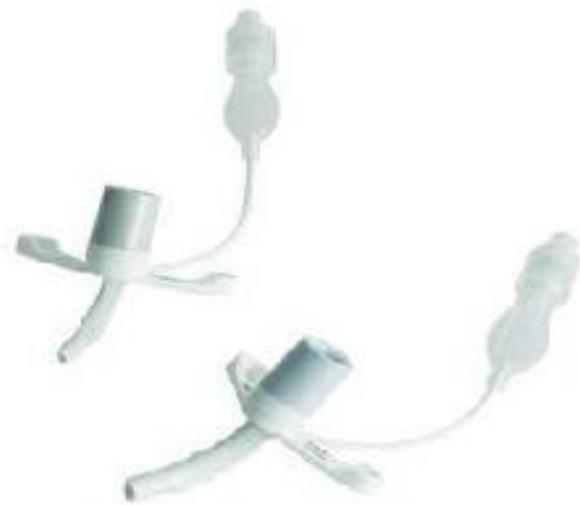
# Tracheostomy tubes

## Types:

- Material
  - Metal (Silver-Stainless steel)
  - Plastic (Polyvinyl chloride)
  - Silicone
- Cuffed or Uncuffed
- Single or double tubes
- Fenestrated or unfenestrated tubes



Silver tube



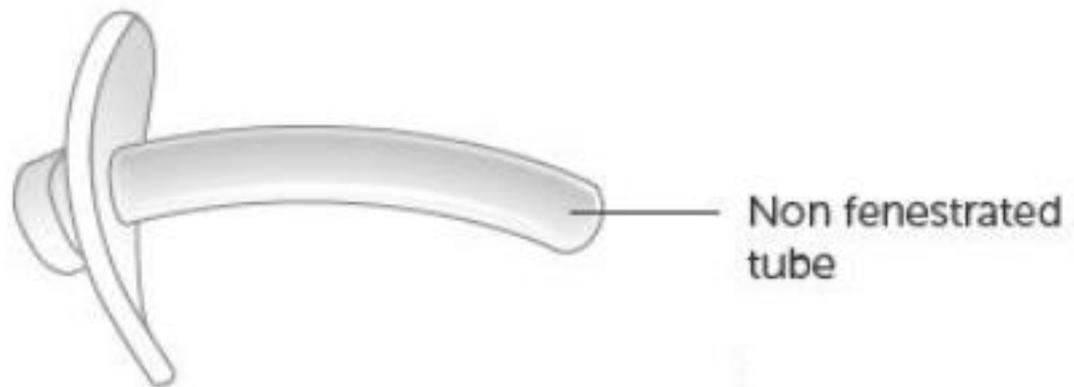
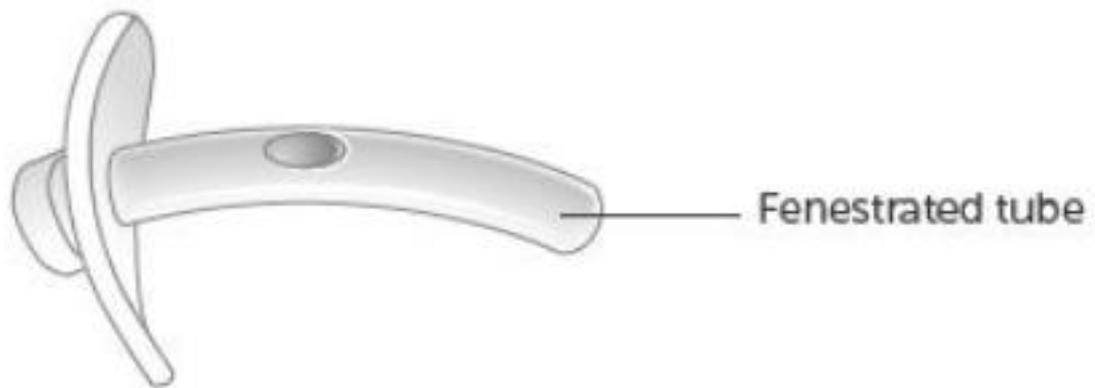
Pediatric silicone tube



Cuffed tube



Uncuffed tube



**Obturator** - The obturator is only used during insertion of the tracheostomy tube. It replaces the inner cannula during insertion. **Must always be present at patient bedside in case of accidental decannulation.**

**Cuff** - Is the balloon around the outer cannula that is inflated to maintain a seal around the tube.

**\*\* Note: not all trachs have cuffs.**

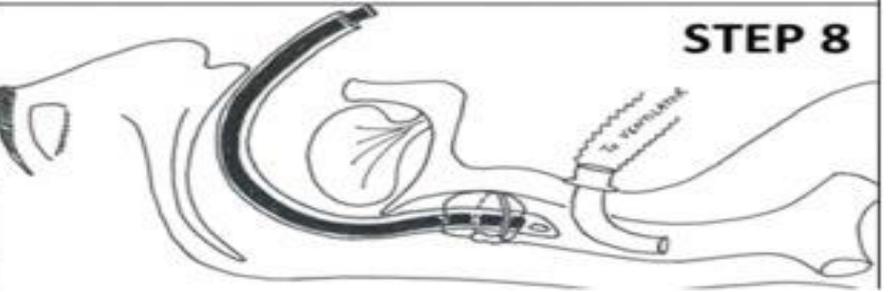
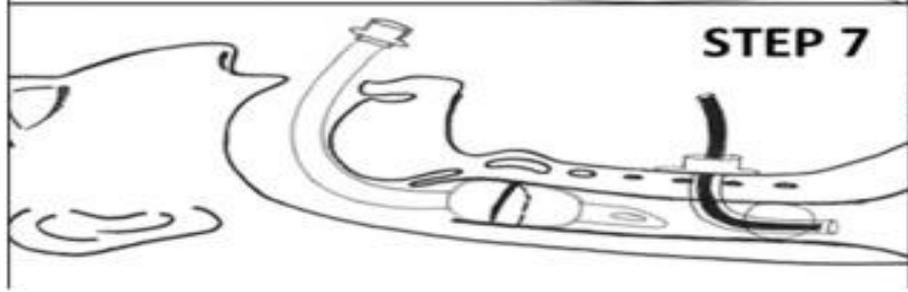
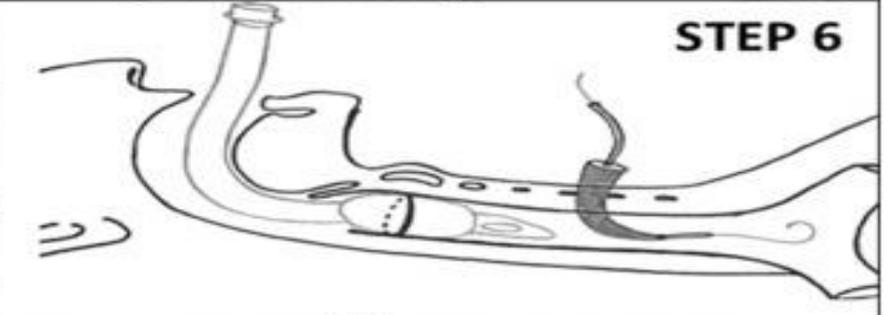
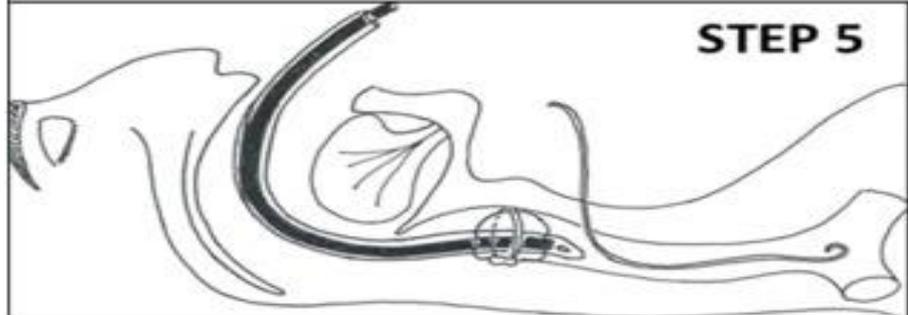
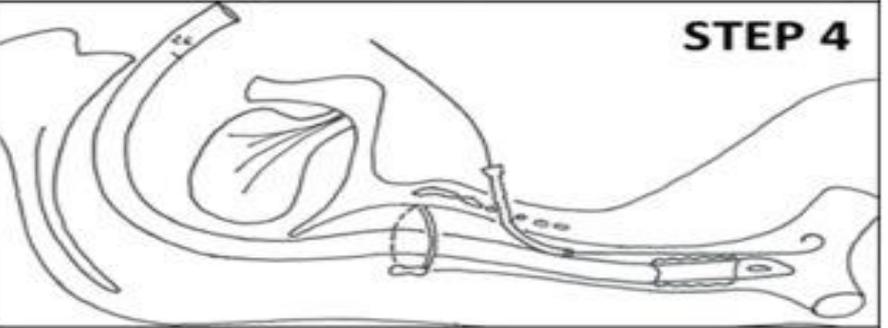
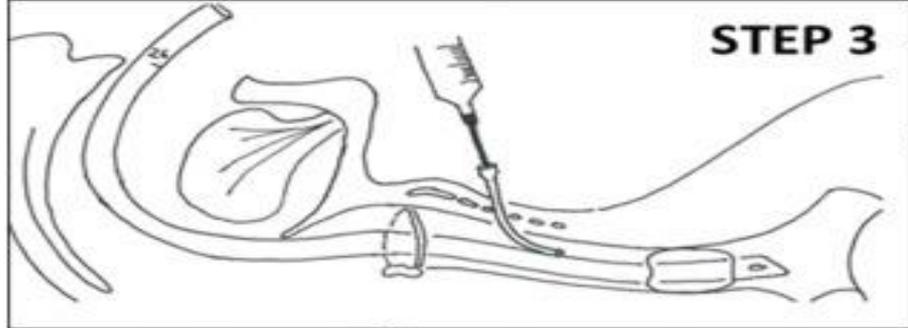
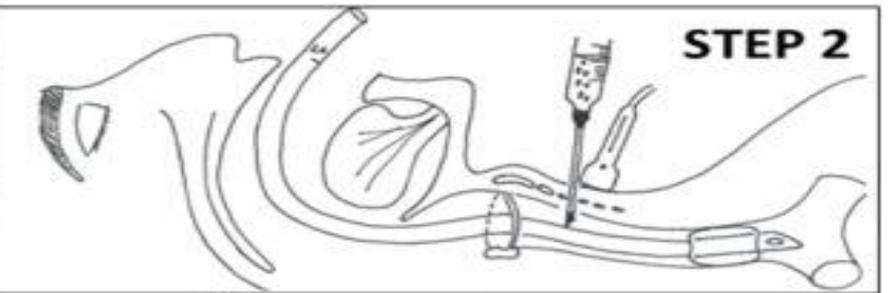
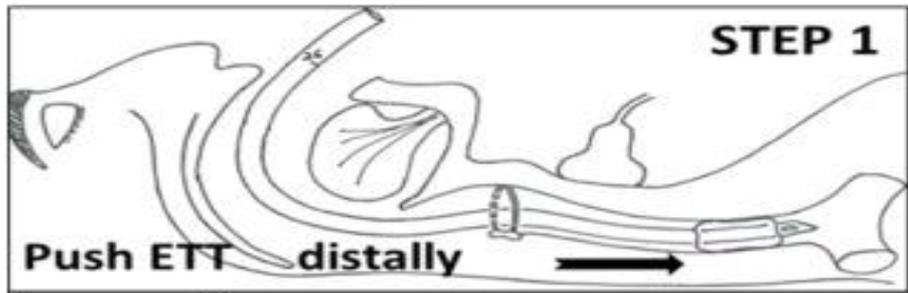
# *Procedures*

- Percutaneous tracheostomy
- Surgical tracheostomy
- Cricothyroidectomy

# *Percutaneous procedure*

- ❖ Curvi-linear skin incision along relaxed skin tension lines between sternal notch and cricoid cartilage.
- ❖ Midline blunt dissection down to the trachea.
- ❖ Insertion of 14-gauge plastic cannula and needle with fluid filled syringe attached into trachea. Aspiration of air confirms correct placement of the tip in the trachea.
- ❖ Removal of needle leaving cannula in place.
- ❖ Insertion of soft tipped guide wire into trachea through cannula.
- ❖ Removal of cannula leaving guide wire in place.
- ❖ Tracheal dilatation
- ❖ Insert tracheostomy tube (with concomitant withdrawal of endotracheal tube), inflate cuff, secure with tape around neck or stay sutures.
- ❖ Connect ventilator tubing.

First step is infiltration of local anesthesia



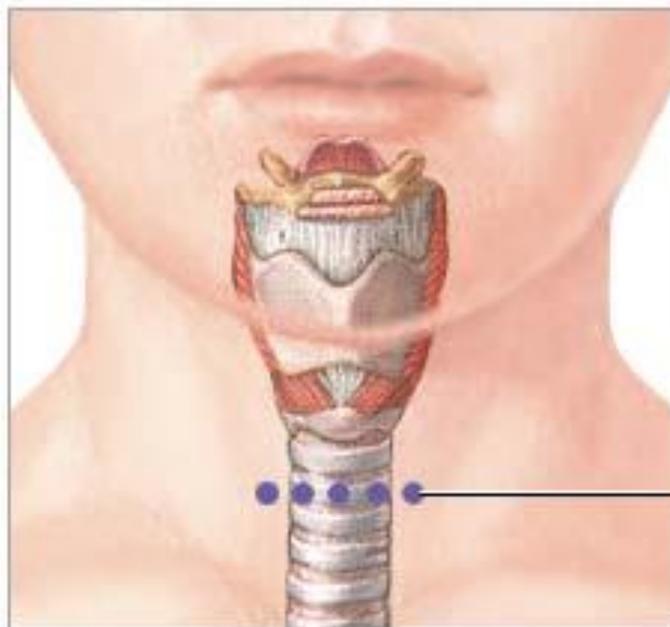
- The **advantages** of percutaneous tracheostomy (PT) **over** surgical tracheostomy (ST) are primarily related to :
  - ICU , Bed Side Tracheostomy
  - Use of guide wire and Dilators
  - Under the vision of Bronchoscope through endotracheal tube
  - Less time ,Less Expensive , reduced tissue trauma
  - Not suitable for thick neck and in emergency

### ***Contraindications include :***

- ***1 .unstable cervical spine***
- ***2.inability to identify anatomic landmarks (in obese , thick neck )***
- ***3.refractory coagulopathy***

# Surgical Procedure

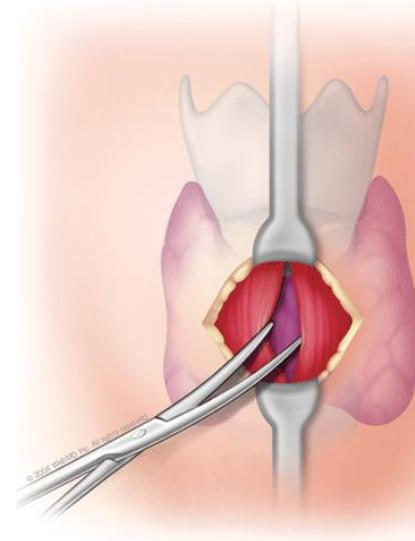
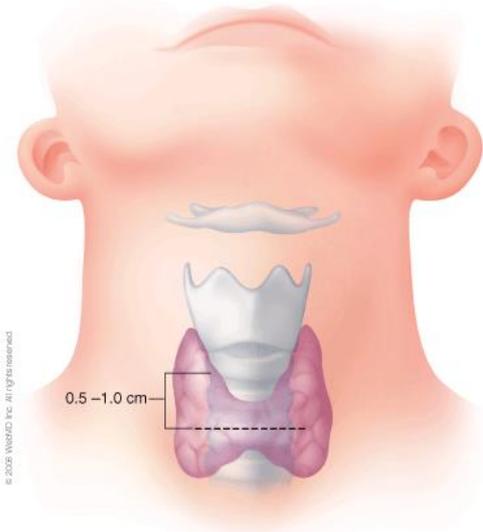
- ✓ Curvi-linear skin incision along relaxed skin tension line (RSTL) **between sternal notch & cricoid cartilage.**
- ✓ Midline vertical incision **from the region of the cricothyroid membrane inferiorly toward the suprasternal notch** with **dividing strap muscles.**
- ✓ Division (or retraction) of **thyroid isthmus inferiorly.**
- ✓ Divide the **2<sup>nd</sup> tracheal ring** & insert tracheostomy tube (with concomitant withdrawal of ETT), inflate the cuff, then secure with tape or sutures. (**don't do the incision at first ring <to prevent the stenosis**)
- ✓ Connect ventilator tubing.
- ❖ Note: the procedure is performed **under GA with endotracheal intubation .**



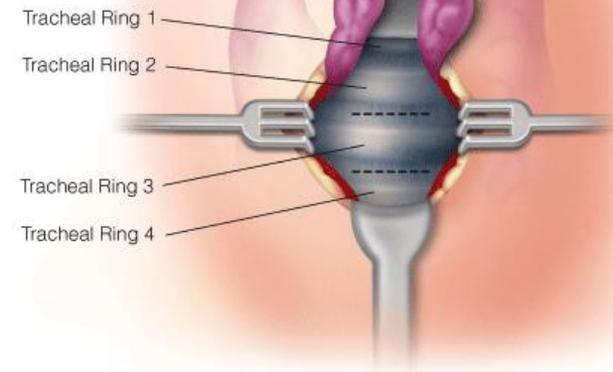
Incision

 ADAM.

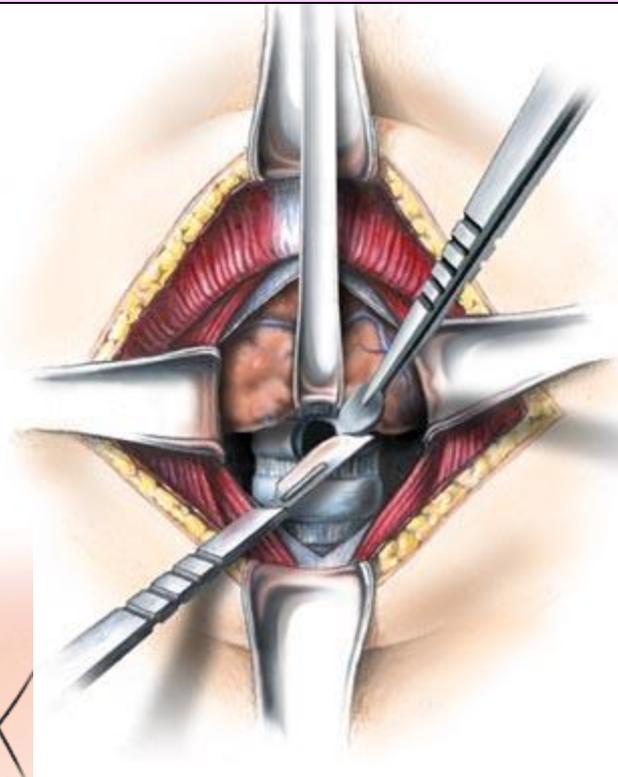
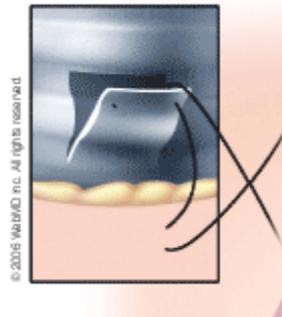
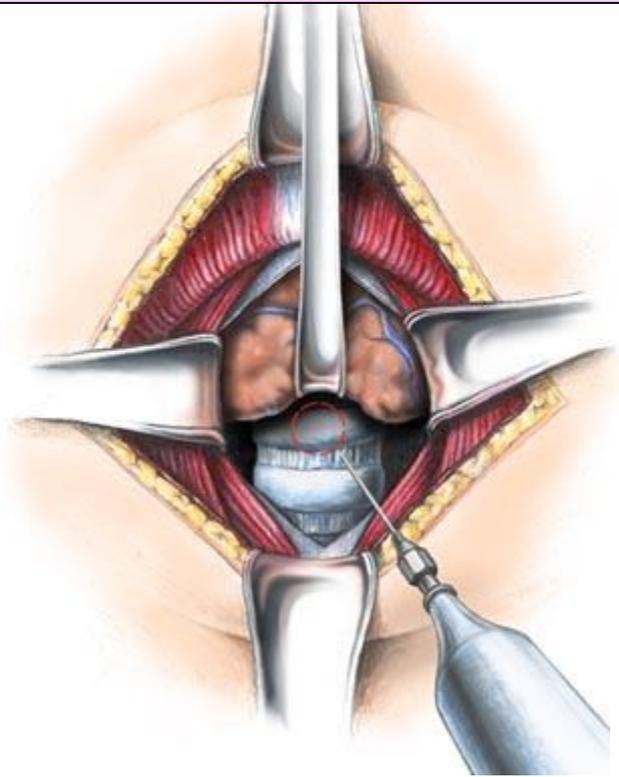
Incision 1 cm below the cricoid or halfway between the cricoid and the sternal notch.



Retractors are placed, the **skin is retracted**, and the strap muscles are visualized in the midline. The **muscles are divided** along the raphe, then **retracted laterally**



The thyroid isthmus lies in the field of the dissection. Typically, the isthmus is 5 to 10 mm in its vertical dimension, mobilize it away from the trachea and retract it, then place the tracheal incision in the second or third tracheal interspace



# Pediatric Tracheostomy

To allow the  
cartilage to  
grow

- ❖ **Vertical incision** in trachea **BTW 2nd and 3rd ring.**
- ❖ No excision of ant. Wall of trachea
- ❖ Secure the tube with neck by two sutures



Scar

# *Cricothyroidectomy*

## *(mini-tracheostomy)*

- ❖ It is an **emergency incision** through the skin & cricothyroid membrane to secure pt's airway during an emergency situation.
- ❖ It is only a **temporary airway** for life-saving situations. It is not suitable for prolonged ventilation due to its small size. A definitive airway (ETT or tracheostomy) must be performed later in hospital for adequate ventilation.

# Indications

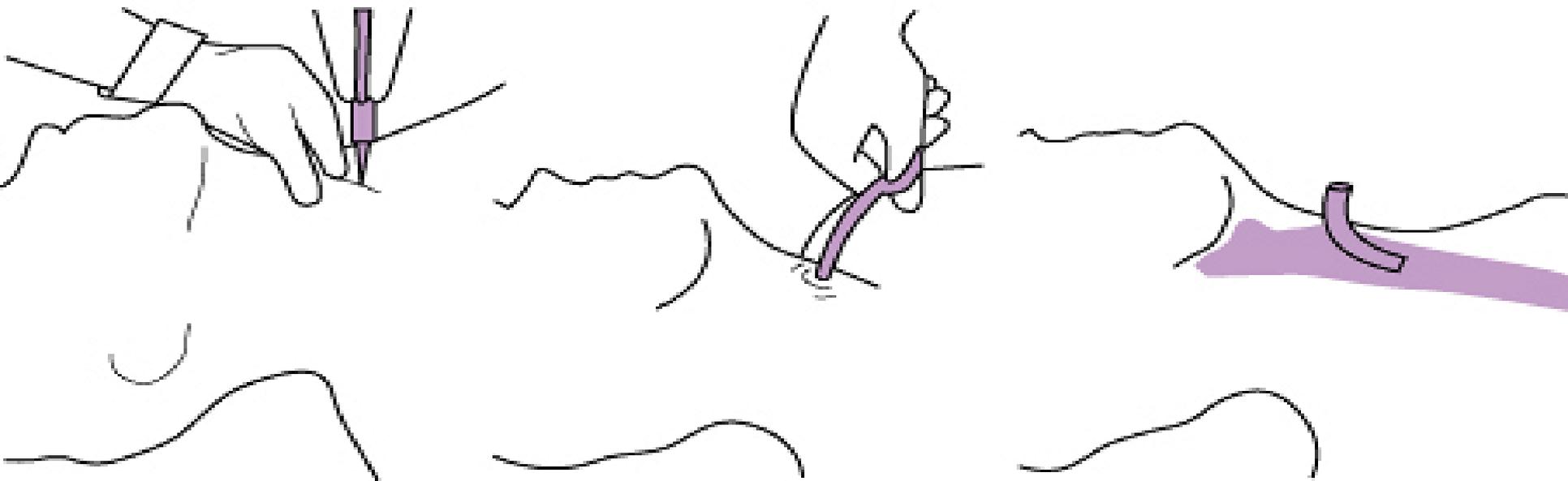
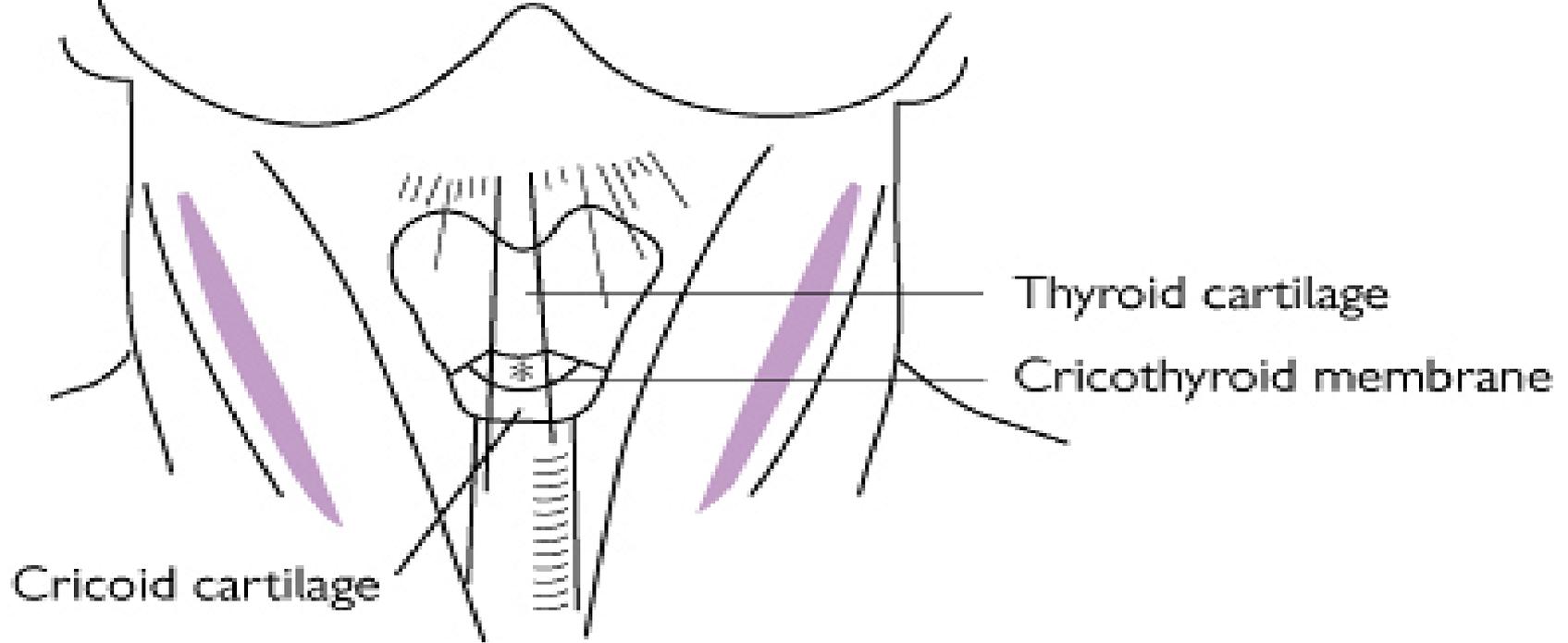
- ✓ Severe facial or nasal injuries that don't allow oral or nasal intubation.
- ✓ Massive midfacial trauma.
- ✓ Possible cervical spine trauma preventing adequate ventilation.
- ✓ Anaphylaxis.
- ✓ Chemical inhalation injuries.

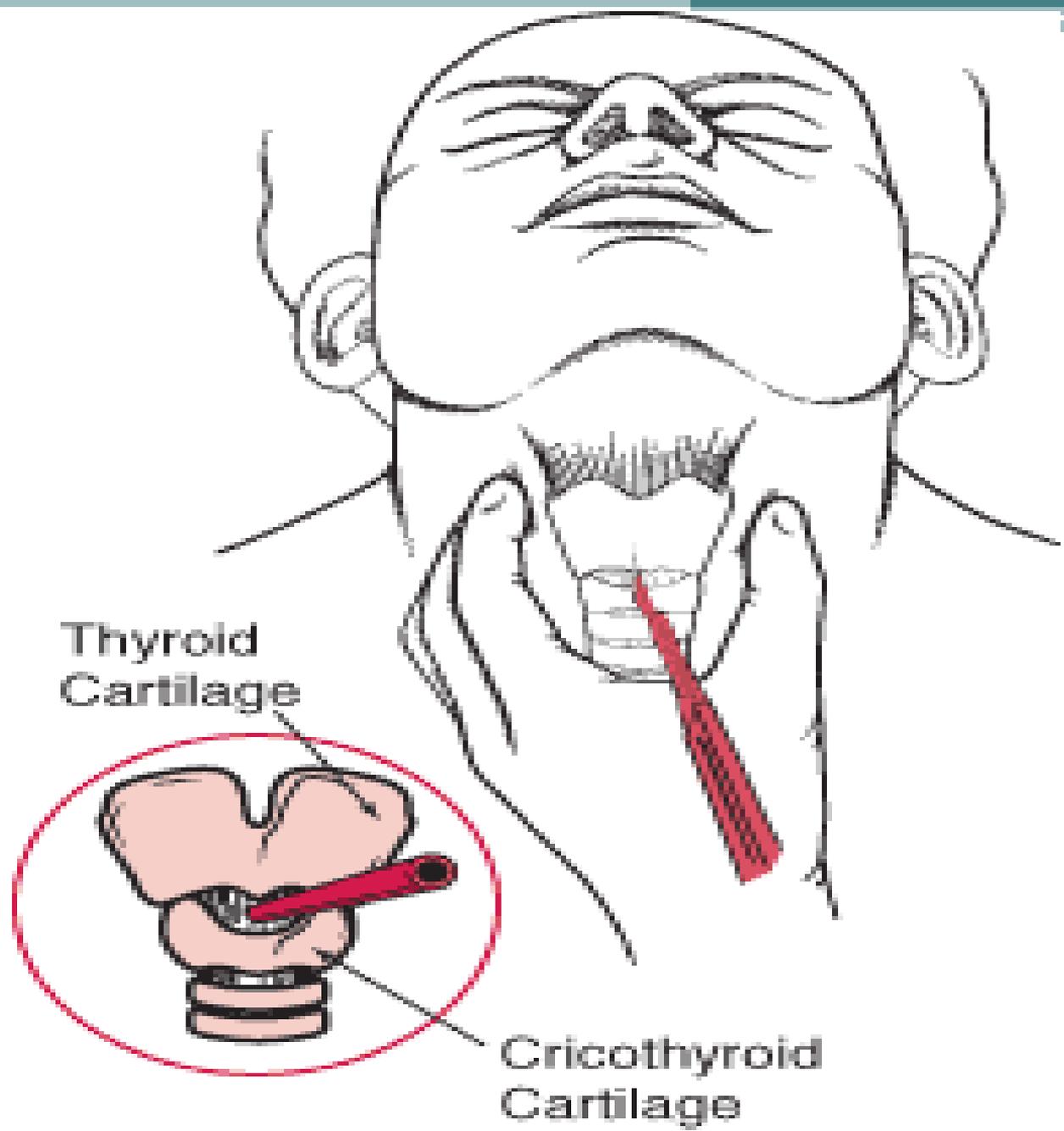
## *Contra-indications*

- ✓ Inability to identify landmarks (cricothyroid membrane)
- ✓ Underlying anatomical abnormality (tumor)
- ✓ Tracheal transection.
- ✓ Acute laryngeal disease due to infection or trauma.
- ✓ Small children <10 years.
- ✓ Patients who have an increased risk of subglottic stenosis, those with inflammatory process in near proximity, epiglottitis and bleeding diathesis.
- ✓ anemia

# Procedure

- ✓ With a scalpel, create a 1 cm transverse incision through the cricothyroid membrane.
- ✓ Open the hole by inserting the scalpel handle into the wound & rotating 90° or by using a clamp.
- ✓ Insert a 6 or 7 mm internal diameter tracheostomy tube or ETT.
- ✓ Inflate the cuff & secure the tube
- ✓ Provide ventilation via a bag-valve device with the highest available concentration of oxygen.





# Postoperative care of tracheostomy

- A **chest x ray** is often taken, especially in children, to check whether the tube has become displaced or if complications have occurred.
- **Antibiotics** may be prescribed to reduce the risk of infection.
- If the patient can breathe without a ventilator, the **room is humidified**; otherwise, if the tracheostomy tube is to remain in place, the air entering the tube from a ventilator is humidified.
- **Swallowing** : Evaluate the patient's risk of aspiration before feeding begins.

## • **Position**

- Adult patients in the postoperative period should usually be sitting well propped up; care must be taken in infants that the chin does not occlude the tracheostomy and the neck should be extended slightly.

## \* **Tube changing**

Tube changing should be avoided if possible for 2 or 3 days, after which the track should be well established and the tube can be changed easily.

Cuffed tubes need particular attention, with regular deflation of the cuff to prevent pressure necrosis.

The amount of air in the cuff should be the minimum required to prevent an air leak.

# Closure of tracheostomy

Remain closure of tube for 24/48 h >and lock for o2 sat

- Before we close it we must ensure that there's adequate breathing in the absence of tracheostomy.
- If the tracheostomy is temporary, the tube will eventually be removed.
- Healing will occur quickly, leaving a minimal scar.
- Occasionally a stricture, or tightening, of the trachea may develop, which may affect breathing.
- If the tracheostomy tube is permanent, the hole remains open and further surgery may be needed to widen the opening, which narrows with time.

## Tube Occlusion

➤ Signs of tube occlusion include:

- Difficult or laboured breathing
- Use of accessory muscles
- None or limited expired air from tracheostomy tube
- Pale/Cyanosed skin color
- Anxiety
- Increase Pulse and Respiratory Rate
- Clamminess
- Cessation of respiration

# Complications of Tracheostomy

- Complications **5-40%**
- Mortality **<2%**
- Complications are more frequent in **emergency situations, severely ill patients**



# Surgical Complications

Stage	Complication
Intra-operative	Haemorrhage Airway fire Injury to trachea and larynx Injury to paratracheal structures Air embolism Apnoea Cardiac arrest
Early post-operative	Subcutaneous emphysema Pneumothorax/pneumomediastinum Tube displacement Tube blockage (crusts) Wound infection Tracheal necrosis Secondary haemorrhage Swallowing problems
Late post-operative	Haemorrhage Granuloma formation Tracheo-oesophageal fistula Difficult decannulation Tracheocutaneous fistula Laryngotracheal stenosis Tracheostomy scar

- ❖ Children, post head trauma, burn pts, & seriously debilitated pts are more susceptible to complications.
- ❖ The most common complications are hemorrhage, followed by tube obstruction, then tube dislodgement.