Tracheostomy

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TRACHEA

• **Trachea**: A mobile cartilaginous and membranous tube forming the passage for air between the larynx and bronchi.

Extent:

• Begins: Lower border of cricoid cartilage (C6 vertebra).
• Ends: At the carina, dividing into right & left main bronchi at the sternal angle (level of intervertebral disc between T4 & T5).
• Total extent: C6 → T4/5.

Adults:

• Length: ~ (average 11.5 cm), Diameter: ~ 2–2.5 cm.
• Infants: Length: 4–5 cm.
• Diameter: as small as 3 mm (→ explains why even mild edema can cause severe obstruction in infants).

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

Cervical Relations

Anteriorly:
• Isthmus of thyroid gland (crosses 2nd–4th tracheal rings).
• Inferior thyroid veins.
• Sternohyoid muscle.
• Sternothyroid muscle.

Laterally:
• Lobes of thyroid gland.
• Common carotid artery (within carotid sheath).

Posteriorly:
• Esophagus.
• Recurrent laryngeal nerve (lies in tracheoesophageal groove).

Blood supply

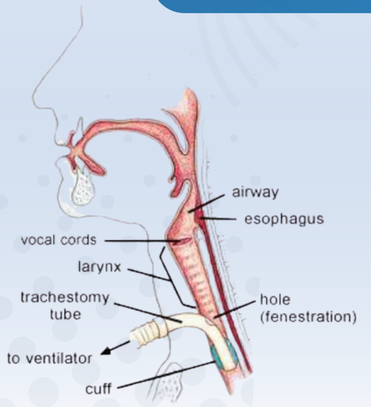
• Upper 2/3 → Inferior thyroid arteries
• Lower 1/3 → Bronchial arteries

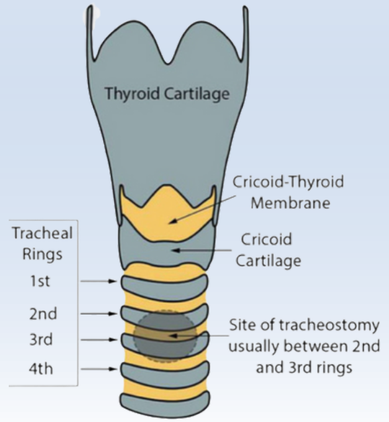
Venous

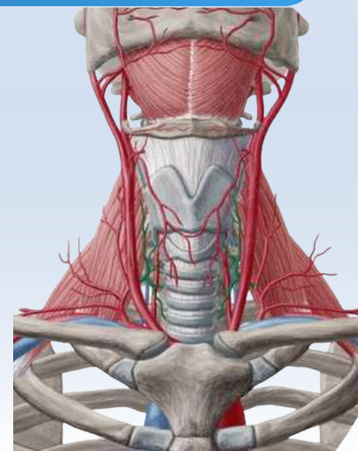
• Follows corresponding arteries

Lymphatic

• Paratracheal nodes.
• Pretracheal nodes.
• Deep cervical nodes.

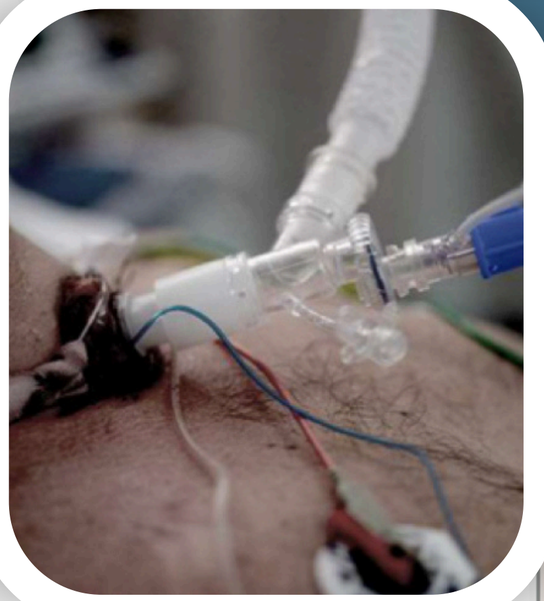


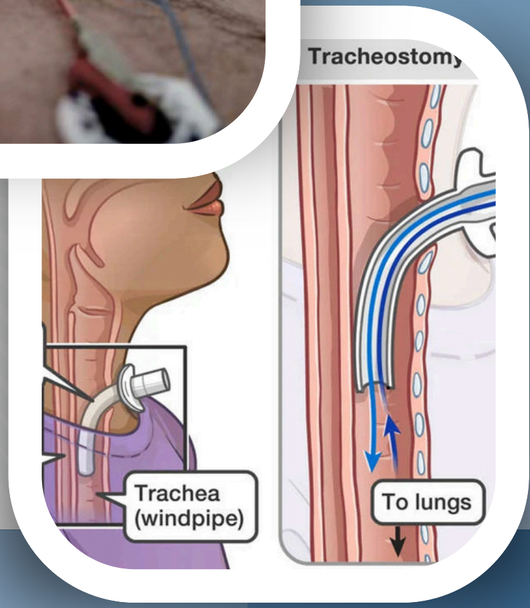




Tracheostomy

- A surgical procedure where an opening is created in the anterior wall of the cervical trachea, just below the larynx.
- A tube is inserted into this opening to establish an artificial airway.
- Provides a direct passage for air when the upper airway is obstructed or impaired.
- May be temporary (transient) or permanent, depending on indication.





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

Permanent Tracheostomy

- This stoma in the anterior tracheal wall kept open by the rigidity of tracheal cartilage.
- The patient breathes through this stoma permanently, for the remainder of his/her life.
- There is no connection between the nasal passages and the trachea.

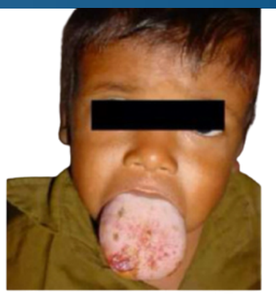
→It is most often performed in patients who have had difficulty weaning off a ventilator, followed by those who have suffered trauma or a catastrophic neurologic insult
One of the most indection for permanent tracheostomy is total laryngectomy

Indication:

✓Acute indications.
✓Chronic indications.
✓Elective procedure

Acute indications

1. Maxillofacial injuries.
2. Poisoning
3. Upper airway obstruction.
4. 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, haemangioma of the larynx
Infective	Acute epiglottitis, laryngotracheobronchitis, diphtheria, Ludwig's angina
Malignancy	Advanced tumors 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-operative complication of thyroidectomy, cardiac or oesophageal surgery, bulbar palsy
Foreign body	Swallowed or inhaled object lodged in upper airway causing

Chronic indications

1. Pulmonary Ventilation

- prolonged intubation :

Tracheostomy should be performed in a patient still requiring ventilation through an endotracheal tube for more than two week. Because it reduce respiratory dead space 30% and make weaning easier

- Tetanus; Brain-stem stroke , Coma

2. Pulmonary Toilet

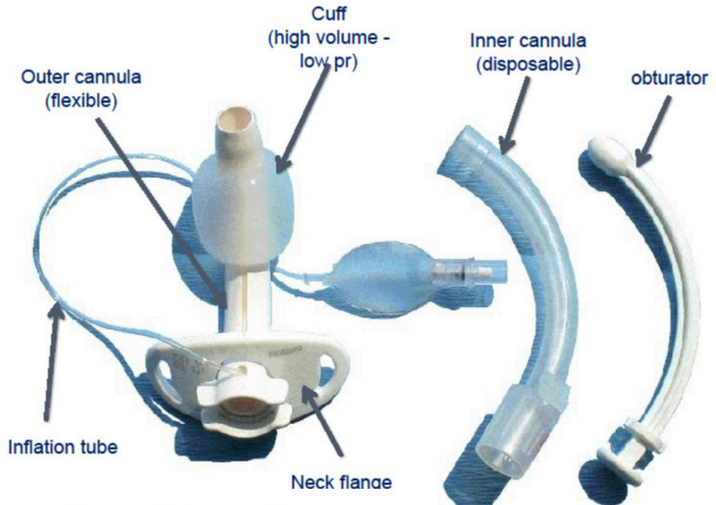
- Those who cannot cough and clear their chest.
- Prevent aspiration by low pressure high volume cuff tracheostomy tube.
- Any condition causing pharyngeal or laryngeal incompetence may allow aspiration of food, saliva, blood or gastric contents.
- Respiratory failure due to central depression of res.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

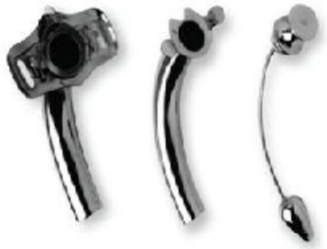
—> best for sleep apnea & chronic aspiration

Elective procedures

- For major head and neck operations.

Tracheostomy tubes





Silver tube

Pediatric silicone tube

Cuffed tube

Uncuffed tube

Types:

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

Procedures

- Percutaneous tracheostomy
- Surgical tracheostomy
- Cricothiroidectomy

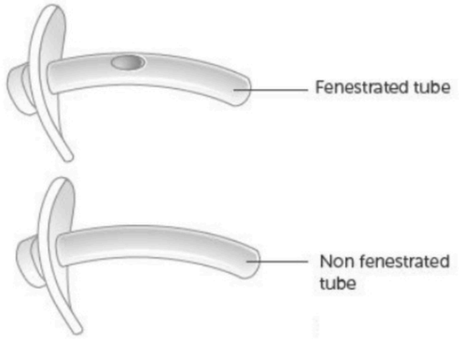
Obturator

- **Used only during insertion of the tracheostomy tube.**
- **Replaces the inner cannula during insertion → provides a smooth, rounded tip to prevent trauma.**
- **Must always be kept at the patient's bedside for emergency reinsertion in case of accidental decannulation.**
- **Removed immediately once the tube is in place.**

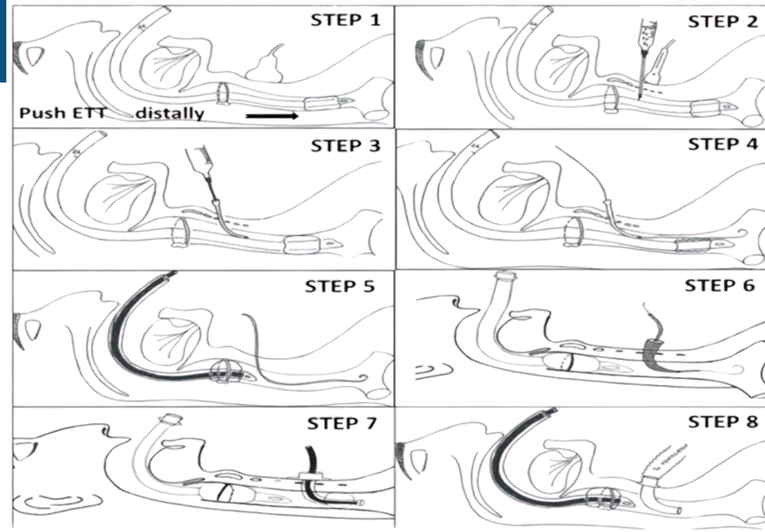
Cuff

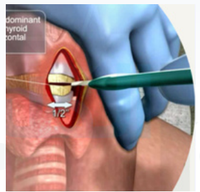
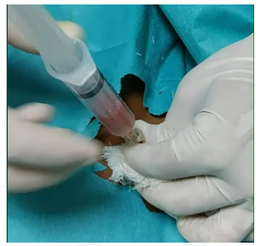
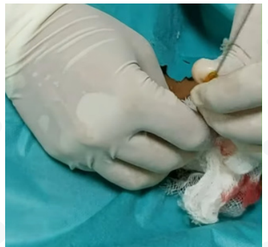
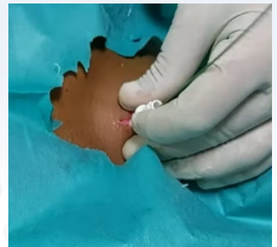
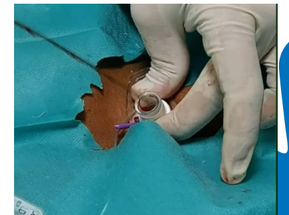
- **A balloon around the outer cannula.**
- **Inflated to create a seal between the tracheostomy tube and tracheal wall.**
- **Functions:**
- **Prevents air leak → ensures effective ventilation.**
- **Reduces aspiration risk of secretions.**
- **⚠Note: Not all tracheostomy tubes have cuffs**

Fenestrated for speech



PERCUTANEOUS TRACHEOSTOMY



Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
1. Patient Preparation	**2. Skin Incision**	**3. Dissection**	**4. Tracheal Access**	**5. Guide Wire Placement**	**6. Tract Dilation**	**7. Tracheostomy Tube Insertion**	**8. Connection**
• Position: Supine with extended neck • Sterile prep and draping • Local anesthesia infiltration	• Curvi-linear incision along relaxed skin tension lines • Location: Between sternal notch and cricoid cartilage	• Midline blunt dissection down to trachea	• Insert 14-gauge cannula + needle with fluid-filled syringe • Aspirate air → confirms correct placement of the tip in the trachea. • Remove needle, leave plastic cannula in place	• Insert soft-tipped guide wire through cannula • Remove cannula, leaving guide wire in place	• Dilate tracheal tract over the guide wire to accommodate tube	• Insert tracheostomy tube over dilator (or with concurrent endotracheal tube withdrawal) • Inflate cuff • Secure tube with tape or stay sutures	• Connect ventilator tubing
							

PERCUTANEOUS TRACHEOSTOMY

The Advantages

- 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

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

Surgical Proceure:

✓ Curvi-linear skin incision along relaxed skin tension line (RSTL) between sternal notch & cricoid cartilage.

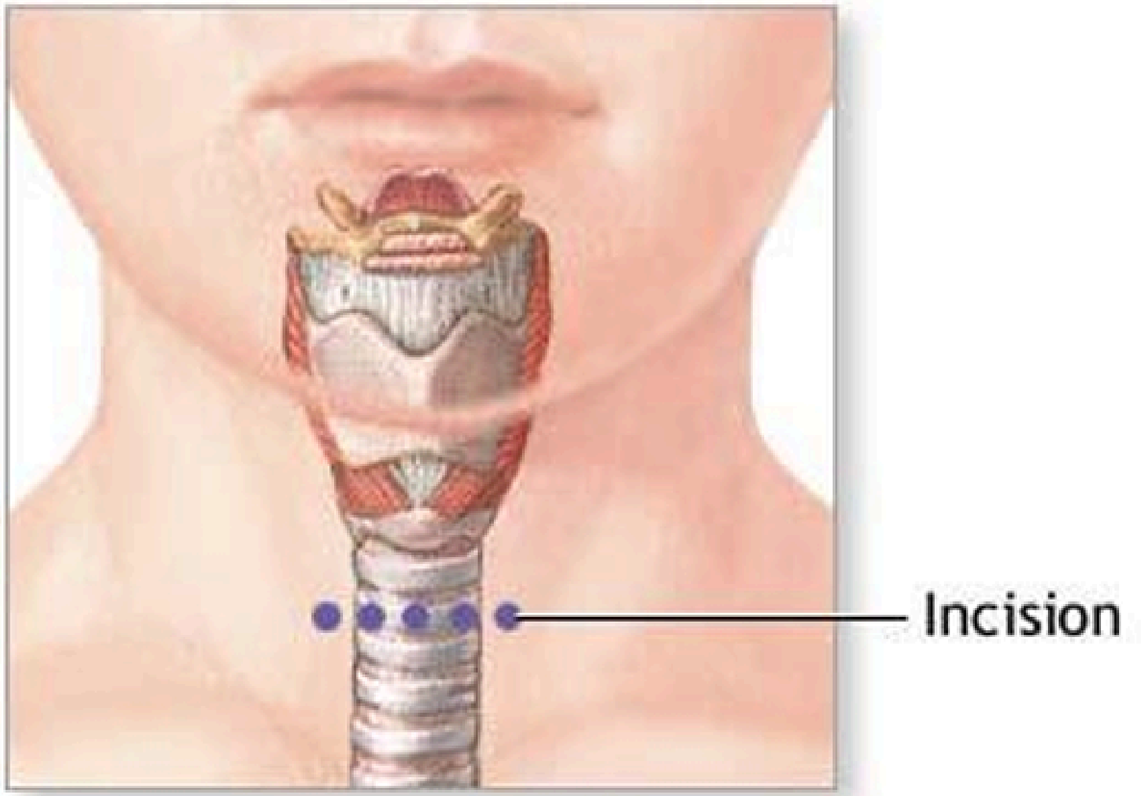
✓ Midline vertical incision from the region of the cricothyroid membrane inferiorly toward the suprasternal notch with dividing strap muscles.

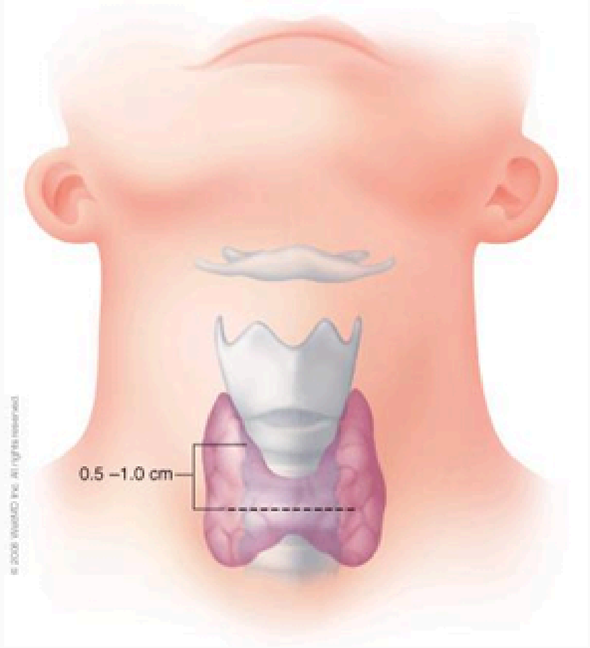
✓ Division (or retraction) of thyroid isthmus inferiorly.

✓ Divide the 2nd 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)

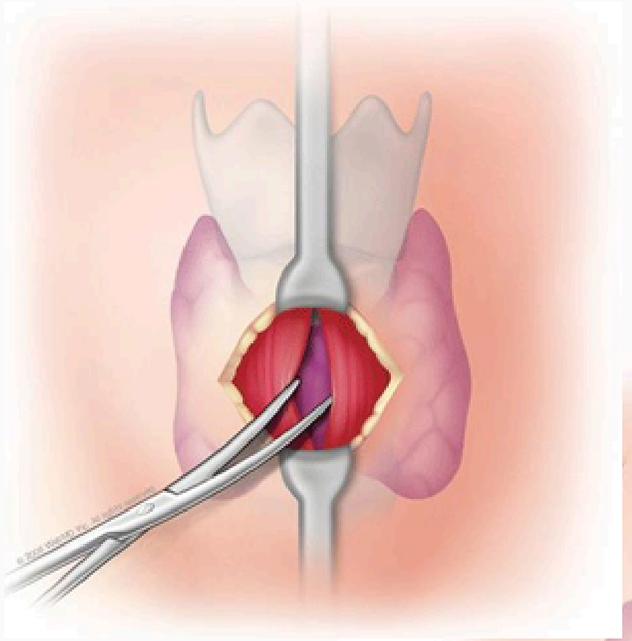
✓ Connect ventilator tubing.

❖ Note: the procedure is peformed under GA with endotracheal intubation .

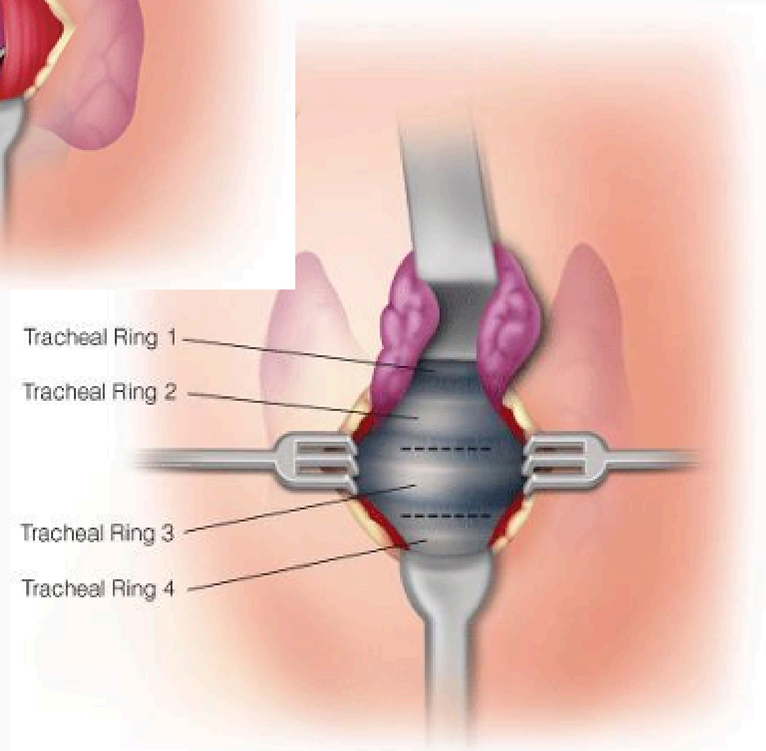

Incision



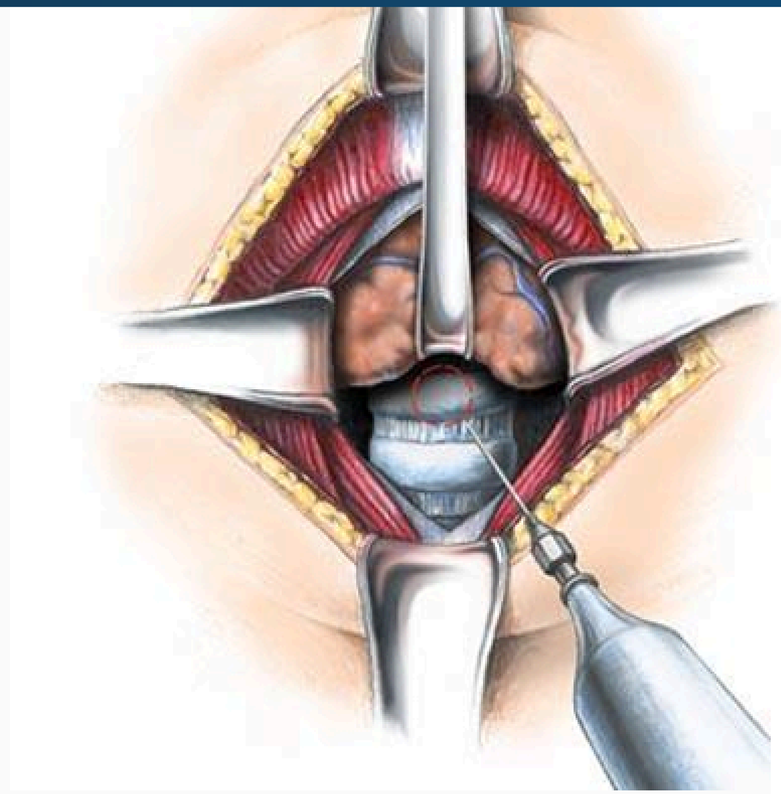
Incision 1 cm below the cricoid or halfway between the cricoid and the sternal notch.

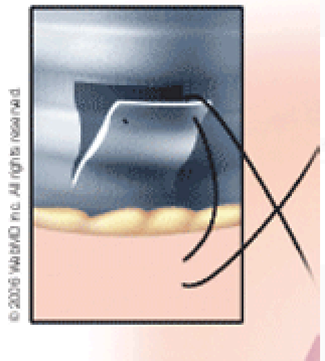


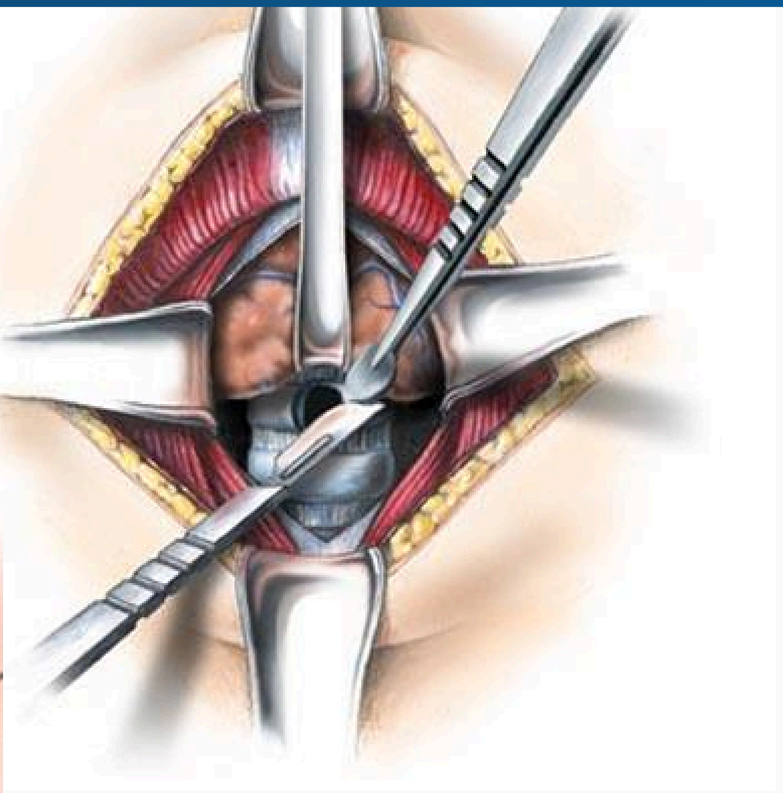
Retractors are placed, the skin is retracted, and the strap muscles are visualized in the midline. The muscles are divided along the raphe, then retracted laterally



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



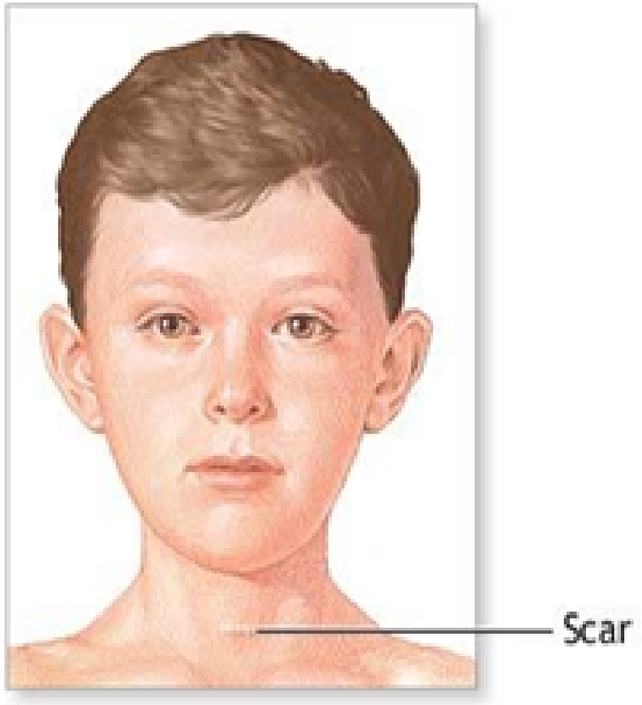




Pediatric Tracheostomy

To allow the cartilage to growth

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



Cricothyroidectomy

(mini -tracheostomy)

❖It is an **emergency incision** through the skin & cricothyroid membrane to secure pt’s airway during an emergency.

❖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 the 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 an inflammatory process in near proximity, epiglottitis, and bleeding diathesis.
✓ anemia

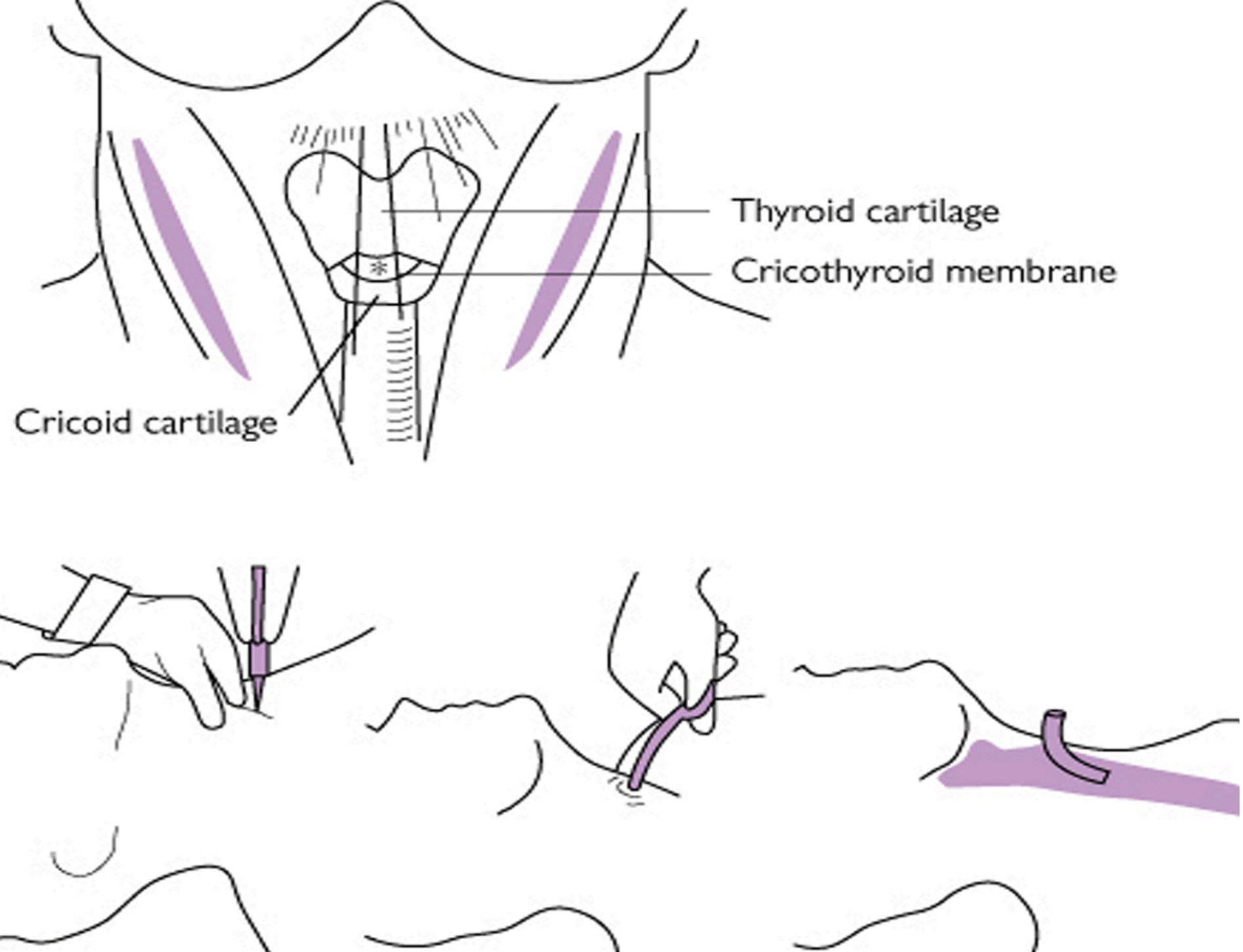
Procedure

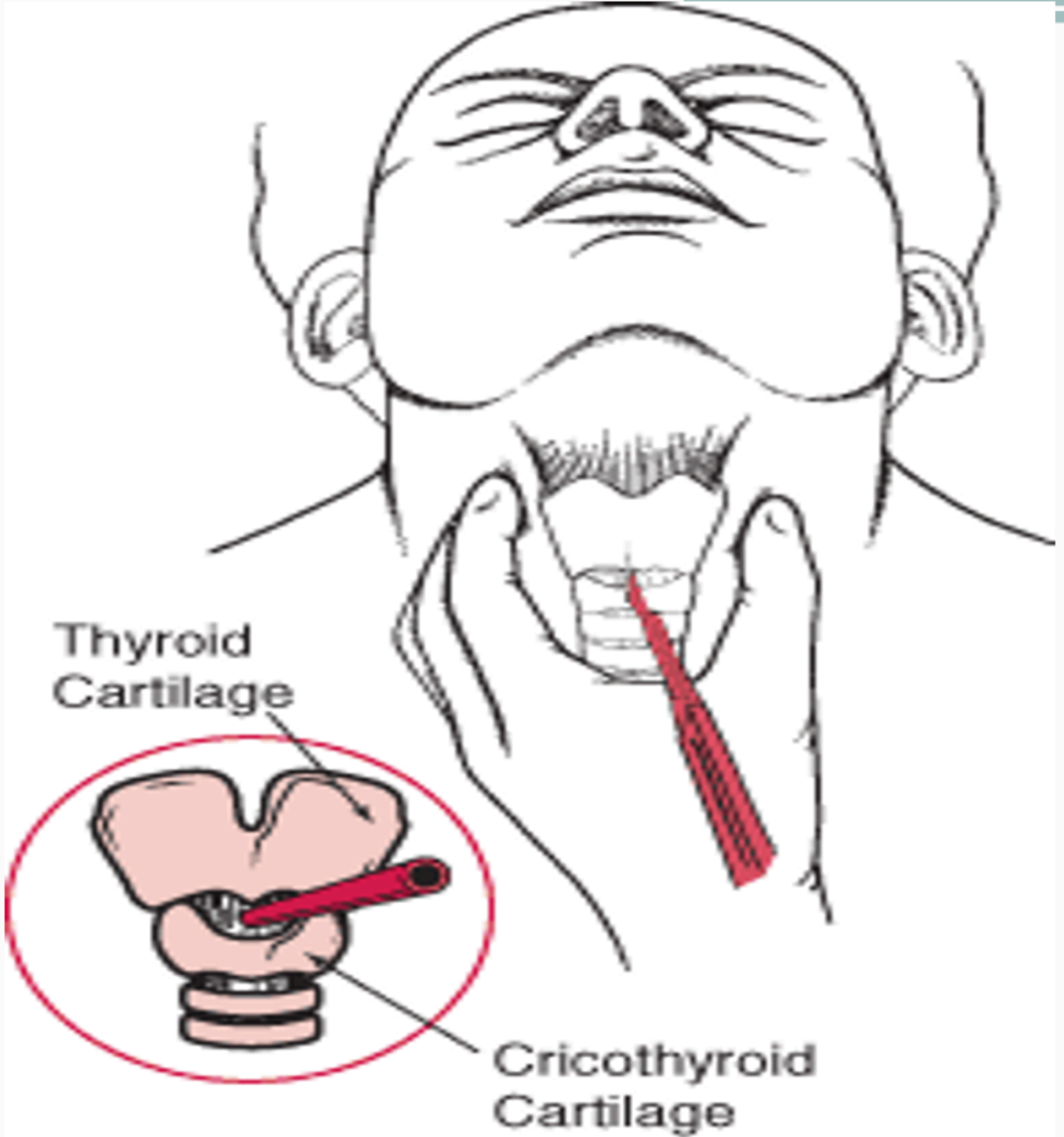
✓ With a scalpel, create a 1 cm transverse incision through the cricothyroid membrane.

✓ Open the hole by inserting the scalpel handle into the wound & rotating 90o 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


Thyroid cartilage
Cricothyroid membrane
Cricoid cartilage


Thyroid
Cartilage
Cricothyroid
Cartilage

Postoperative care of tracheostomy

- A **chest x ray** is often taken, especially in children, to check whetherthe tube has become displaced or if complications have occurred.
- **Antibiotics** may prescribedto reduce the risk of infection.
- If the patient can breathe without a ventilator, the **room is humidified**; otherwise, if the tracheotomy 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**
  - Adultpatients in the postoperative period should usuallybesittingwellproppedup;caremustbetaken in infants that the chin does not occlude the tracheostomy and the neck should be extended slightly.

*** Tube changing**

Tube changingshouldbeavoidedif possiblefor2or3 days, after which the track should be well established and the tube canbe changed easily.

Cuffed tubes need particular attention, with regular deflation of the cuff to prevent pressure necrosis. Theamount ofair in thecuff shouldbe 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.
- Ifthetracheostomyistemporary,thetubewill eventually be removed.
- Healingwilloccurquickly,leavingaminimal scar.
- Occasionallyastricture,ortightening,ofthe trachea may develop, which may affect breathing.
- Ifthetracheostomytubeispermanent,thehole 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 ptsare more susceptible to complications.

- The most common complications are hemorrhage, followed by tube obstruction, then tube dislodgement.