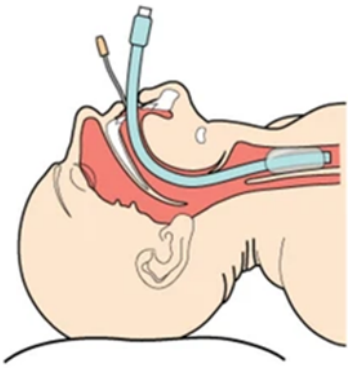
Endotracheal Tube

AKA – ‘Tube’, ‘ETT’



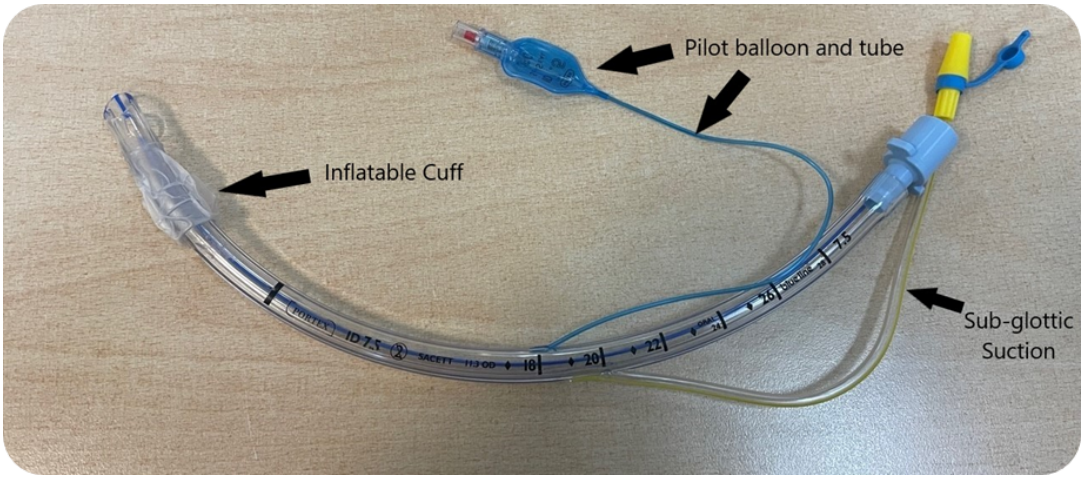
What is it?

Plastic tube with an inflatable cuff that is inserted into the trachea via the mouth. Cuff is inflated to form a seal around the walls of the trachea. It is used to facilitate ventilation via a ventilator.

How does it work?

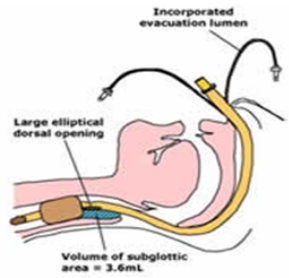
The tube tip and cuff sit below the level of the glottis (vocal cords) in the trachea and the top outside the mouth. This keeps the airway patent and allows for complete control of ventilation externally as there is a seal around the trachea from the cuff.

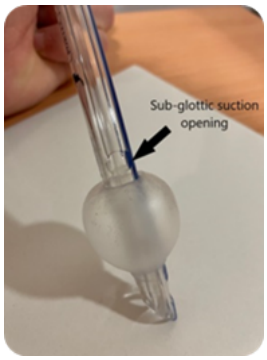
What does it look like?



What does it do?

An ETT allows direct access to trachea predominantly for mechanical ventilation. It also serve as a way to access the airways directly; this can be used for suctioning and bronchoscopy.





The tubes used in Critical Care also have subglottic suction ports. These are narrow tubes that run along the length of the ETT and have an opening just

above the level of the cuff. This allows for the removal of secretions that can pool on top of the cuff over time.

What can go wrong?

The majority of patients who have an ETT in situ, are completely reliant on it to maintain their airway, most likely because they are sedated and would obstruct their airway if it wasn't present. Given this, you should have a very low threshold for calling for senior help if you have any concerns. That being said, it is useful to understand some common complications;

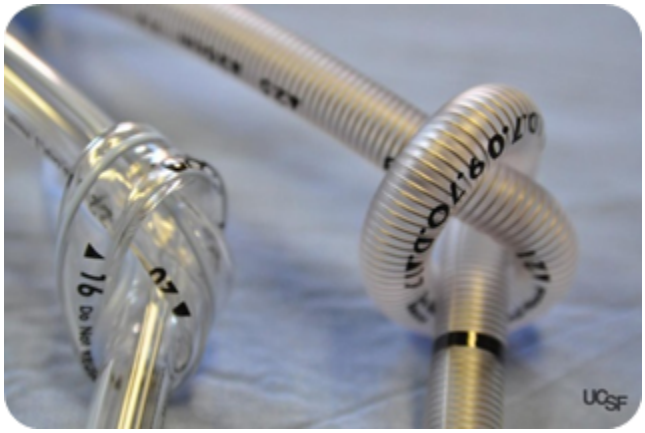
- Displaced tube
    - This is an airway emergency and requires senior help immediately, particularly if tip of tube is no longer below level of the glottis (although this is unlikely when cuff fully inflated)
    - → If the cuff is only slightly displaced and is causing a small air leak (see *cuff deflation,* below), you may be able to temporarily fix this by hyper-inflating the cuff (40-50cmH_2O). This can be useful particularly when the tube has displaced partially such that the cuff balloon is 'herniating' through the cords, which is common.
    - → If the tube is significantly displaced, such that the cuff has migrated up through the vocal cords and is no longer forming any seal within the airway despite hyperinflation, it is best to remove the tube and ventilate the patient manually (either with bag-valve mask or water circuit). **Do not attempt to 're-insert' the tube,** wait for senior help.
- Cuff deflation
    - All cuffs will deflate gradually over time, but occasionally they will deflate acutely either due to user error/fault with the cuff.
    - Can be identified either by the ventilators (check what the alarm says), or by listening for a cuff leak - it sounds like a bubbling/gurgling sound, particularly on inspiration.
    - → Re-inflate the cuff to a pressure higher than pInsp pressure on the ventilator. This may require a re-check after a few seconds with a manometer to ensure the cuff is not punctured. If this is not successful, seek help immediately. It is likely that the cuff/pilot tube is faulty, or the tube has been displaced
- Tube obstruction
    - Should be alerted to this by ventilator alarms/poor air entry
    - May occur in patients with thick secretions.
    - → If caused by secretions, you should be able to remove blockage with suctioning. If this is unsuccessful then call for help.
    - → If this has happened once, it is likely to happen again. This means that the patient may need treatment to reduce secretions or increase clearance.
- Biting the tube
    - This is common in patients who are 'light' on sedation.
    - → Occasionally, this can be rectified by manual readjustment, but BE CAREFUL as patients are likely to bite anything in between their teeth, including fingers.

- → The majority of cases will require boluses of sedation to release the tube.
- → This can often be prevented with bite-guards on the tube, or bite-blocks that sit in between the patients teeth. As a temporary measure, an oropharyngeal airway can be placed in between the patients teeth.
- If the patient bites a reinforced tube (see *Special Tubes* below), then the tube may remain kinked and not recoil. So extra care should be made to avoid biting.

Special Tubes

- Nasotracheal Tube
  - Occasionally used in OMFS/ENT surgery, if oral ETT would obstruct the view of the surgeon.
  - Smaller in diameter so more likely to block with secretions.
  - Associated with significant sinus infections when left in for more than 48-72 hours

- Reinforced Tubes
  - These are similar to normal tubes, but contain a metal coil to make them stronger and less likely to kink when bent.
  - They are often used in head & neck or neurosurgery when the tube may need to be bent away from patient's face during their operation.
  - Generally very similar to normal tubes, but caution when bitten (see below) and some are not MRI compatible



Additional equipment

- Anchorfast
  - Device used to secure tube and avoid displacement
  - Adhesive pads stick to patients cheeks and then the tube is secured using the bridge between them
  - These better avoid pressure damage than traditional tube ties

- Bite guards/Bite blocks
    - These are devices used to prevent biting of the tube, usually in patients who are light on sedation.
    - Bite guards come directly attached to the anchorfast and reinforce the tube as it passes through the teeth.
    - Bite blocks are wedges of rubber which sit in the patient back teeth, prevent them from biting down

Key safety point

Invariably ETTs are integral to patients' airways in ITU. If they stop working, the patient has no airway.

Other notes

After intubation all patients require a chest X-Ray to assess the position of the ETT. The ideal tip position is 4-5cm above carina

Further reading

patient.info page (Particularly DOPE algorithm), patient.info/doctor/airways-and-intubation