AL-Ayen University
College of Health and Medical Technology
Department of Anesthesia

Endotracheal Airway Devices

Lecture (4) theoretical
Basics of Anesthetic Equipment (1)
2nd Stage
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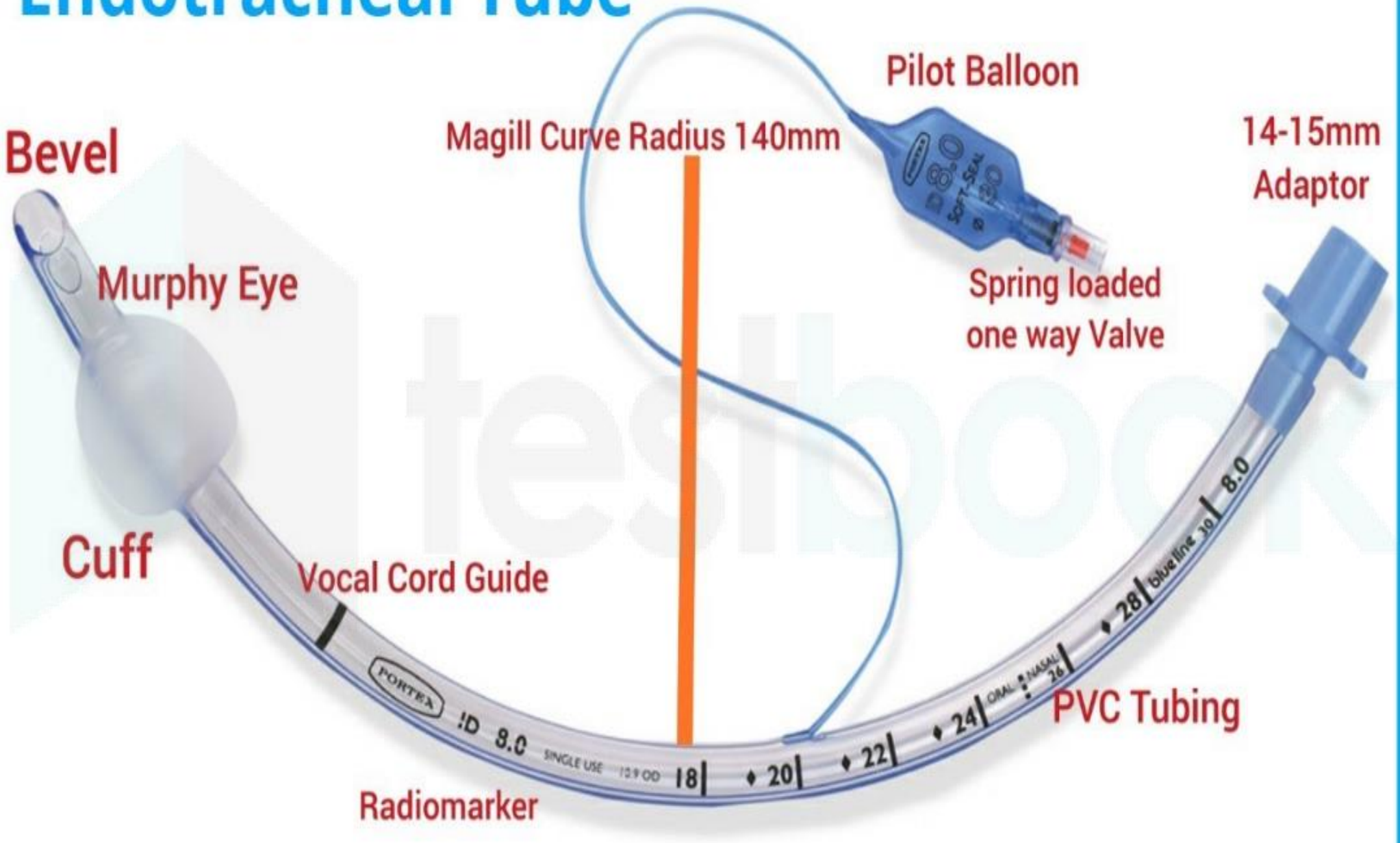
Endotracheal Tube



Endotracheal airway devices:

- provide the oxygenation and ventilation by directly accessing the trachea, allowing gas delivery and exchange to the lungs.

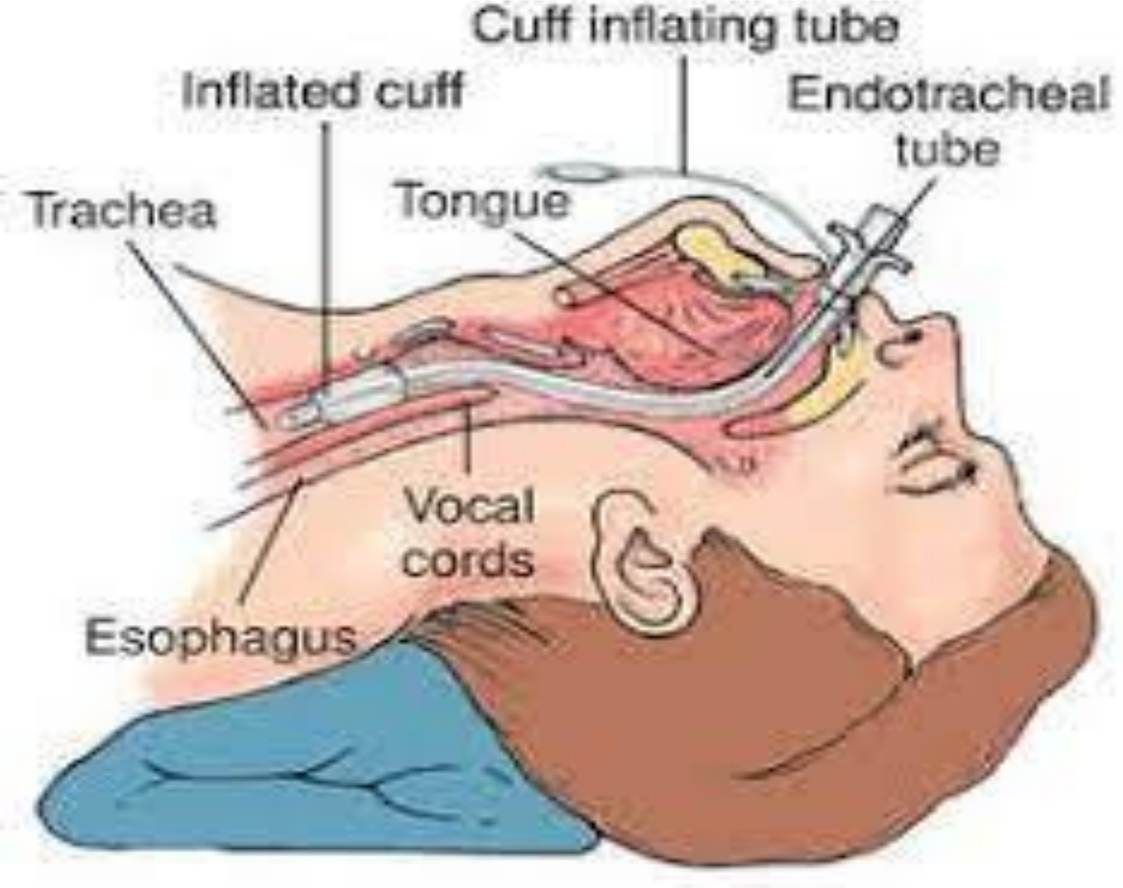
- Endotracheal tubes are endotracheal airway devices inserted orally or nasally, whereas tracheostomy tubes are placed surgically or percutaneously through the trachea

- Endotracheal tubes commonly with a tracheal cuff, are used when a patient's airway needs to be definitively secured from aspiration or when positive pressure ventilation is required.

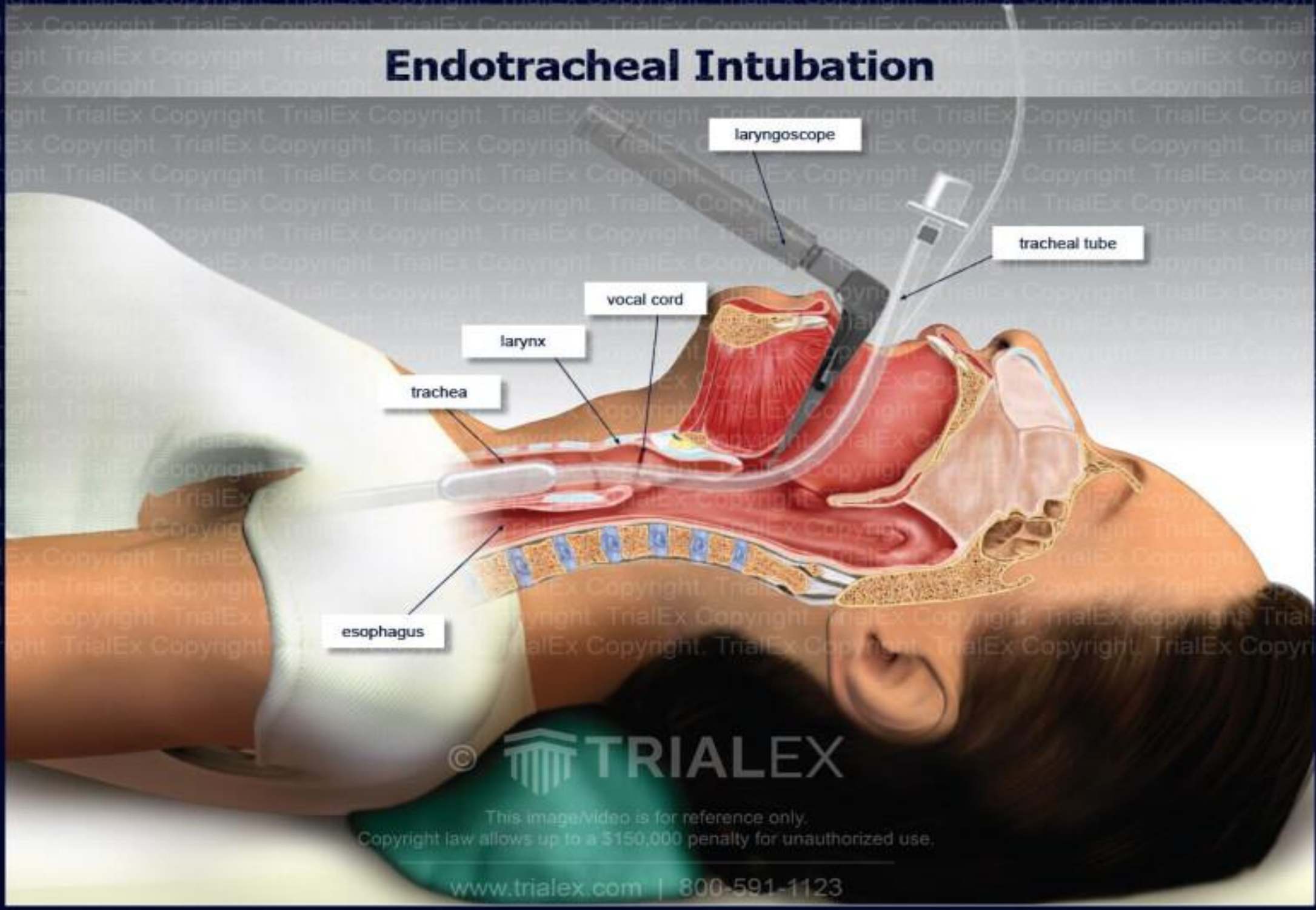
- Endotracheal tubes are curved tubes used for intubation.

❖ Endotracheal Tubes were previously made up of latex (rubber) and those still available , currently plastic clear tubes polyvinyl chloride (PVC) are preferred because of following advantages :

1) Disposable (less chances of infection)
2) Hypoallergenic (since latex allergy is fairly common)
3) Transparent (easy visualization of blockage ETT due to blood , pus , secretions



Endotracheal Intubation



Uses of Endotracheal tube:

1. For Mechanical Ventilation
2. For Intermittent Positive Pressure Ventilation (IPPV)
3. During resuscitation
4. Direct suctioning of trachea in meconium aspiration
5. In Epiglottitis &life threatening croup
6. In tetanus (however for long term bases, tracheostomy is preferable)
7. In diphtheria
8. In angioneurosis edema

How it works:

Modern tubes are single use and made of clear polyvinyl chloride (PVC), whereas the original designs used sterilize rubber. The internal diameter (ID) in millimetres is used to define the size of the tube. for instance an 8.0 mm tube might be used for an average adult male. The outer diameter (OD) is also marked. Larger tubes are more likely to cause trauma on insertion but have less resistance to gas flow, though in adult practice this is usually insignificant. Larger tubes are, however, less likely to become blocked by secretions and may be used where ventilation is expected for long periods in intensive care.

The distal end of the tube has a left-facing bevel to improve the view at laryngoscopy, during which the tube is inserted from the right-hand side. The cuff is positioned just distal to the glottis which, in an adult, leaves the tip of the tube a few centimetres proximal to the carina.

There is often a mark which should remain visible just proximal to the glottis to aid positioning. Many tubes incorporate a ‘Murphy eye’, a side hole at the tip which allows continued ventilation if the end abuts the tracheal wall. It also allows ventilation of an aberrant right upper lobe, which occasionally originates from the trachea several centimetres above the carina.

Cuffed Endotracheal tube:

- The cuff creates a seal in the trachea to allow higher ventilation pressures and to prevent aspiration. It is connected to a pilot balloon which incorporates a valve for injecting air.
- The cuff should be inflated to the lowest pressure at which there is no longer an air leak, which should be in the range of 20–30cmH2O.
- Modern cuffs are usually low-pressure, high-volume designs which spread lower pressures over larger area of trachea.
- Older cuffs were high-pressure, low-volume and risked tracheal ischemia and necrosis if used for long periods.
- Low-pressure, high-volume cuffs are, however, less effective at preventing aspiration because wrinkles form, which over time allow the passage of fluids.

Advantages:

- Helps prevent aspiration.
- Allows high ventilation pressures

Disadvantages:

- Requires advanced airway skills to insert when compared with supraglottic airway devices.
- Risk of pressure necrosis both at the level of the cuff, and in the oropharynx if used for long periods.
- Risk of micro-aspiration through cuff wrinkles, which may lead to ventilator-associated pneumonia.
- Risk of endobronchial intubation (the tube is in too far).
- Risk of cuff herniation proximally through the glottis.

Uncuffed Endotracheal tube :

Uncuffed tubes are often used in pediatrics because of concerns of necrosis caused by cuff pressure at the level of the cricoid cartilage, the narrowest point of the paediatric airway.

Uses

- Paediatrics (neonate,infant).
- Adult sizes are available but are used infrequently

Advantages:

- Uncuffed tubes provide the widest possible lumen for a given external diameter, thus reducing resistance.
- The risk of pressure necrosis caused by a cuff is avoided.
- The lack of cuff reduces risk of trauma at glottis during insertion (or nose during nasal intubation).

Disadvantages:

- Must be correctly sized to prevent a leak.
- Unable to compensate for changes in airway diameter (caused by oedema) occurring during long term ventilation.
- High ventilation pressures not achievable due to leak.

TABLE 19–5 Oral tracheal tube size guidelines.

Age	Internal Diameter (mm)	Cut Length (cm)
Full-term infant	3.5	12
Child	$4 + \frac{\text{Age}}{4}$	$14 + \frac{\text{Age}}{2}$
Adult		
Female	7.0–7.5	24
Male	7.5–9.0	24

Age	Weight (kg)	Size (ID mm)	Length (cm)
Neonate	2–4	2.5–3.5	10–12
1–6 months	4–6	4.0–4.5	12–14
6–12 months	6–10	4.5–5.0	14–16
1–3 years	10–15	5.0–5.5	16–18
4–6 years	15–20	5.5–6.5	18–20
7–10 years	25–35	6.5–7.0	20–22
10–14 years	40–50	7.0–7.5	22–24

Types of Endotracheal tube:

1-Standard Tracheal tube

2-Oxford Tracheal tube

3-Armoured Tracheal tube

4-RAE Tracheal tube

5-Laser – Resistant Tracheal tube

6-Micro Laryngeal Tracheal tube

7-Tracheostomy Tube

8-Double Lumen Endo – bronchial Tube

1-Standard Tracheal tube:

The Component

1-Curved body

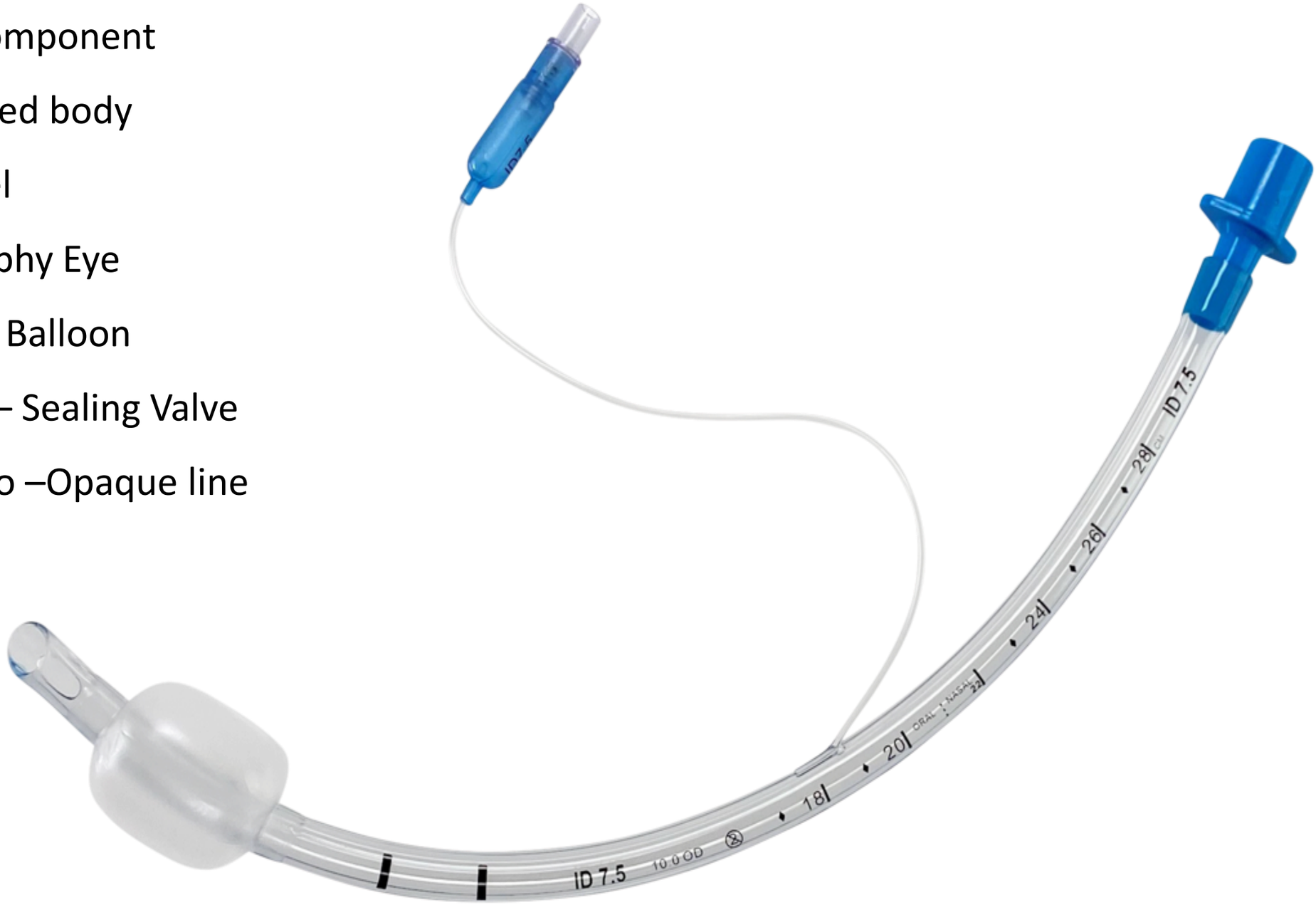
2-Bevel

3-Murphy Eye

4-Pilot Balloon

5-Self – Sealing Valve

6-Radio –Opaque line



2-Armoured Tracheal tube:

- ✓ Also called Flexible or Un- Kinkable tube
- ✓ Contain aspiral of metal wire or Nylon to prevent the kinking and occlusion of the tracheal tube
- ✓ The stylet is used to aid intubation
- ✓ Used in anesthesia for head and neck surgery

3-Oxford Tracheal tube:

- ✓ L shaped tracheal tube
- ✓ Used in anesthesia for head and neck surgery
- ✓ Can be cuffed or uncuffed
- ✓ The Bevel is facing posteriorly

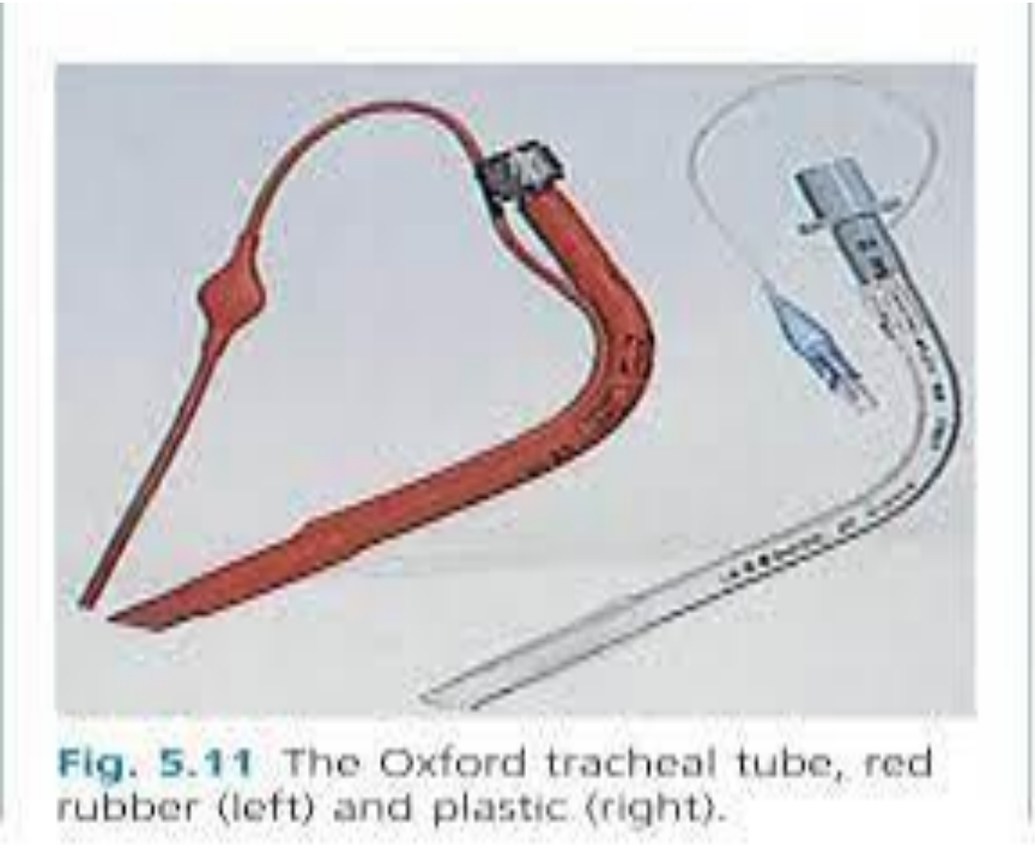
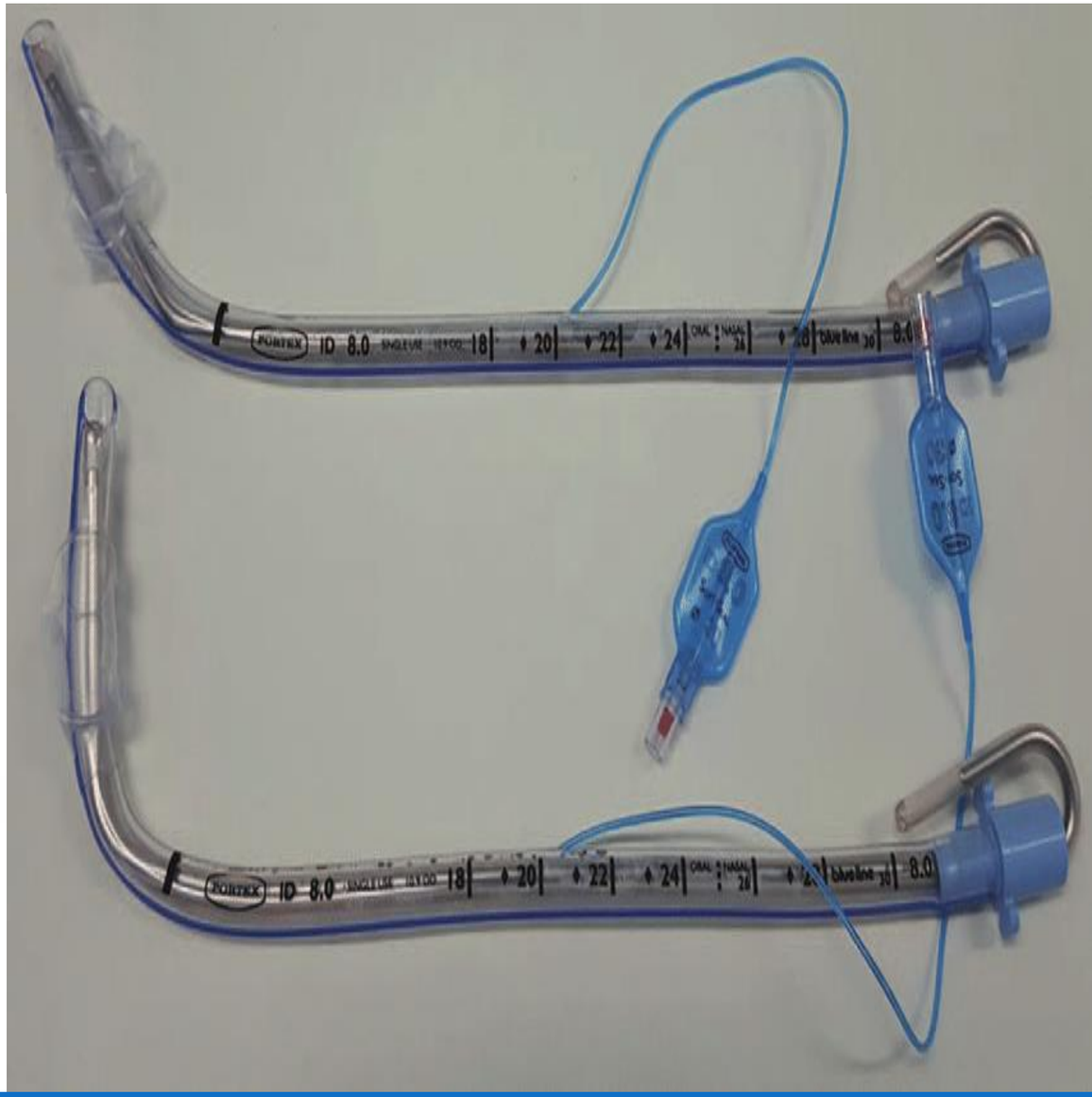
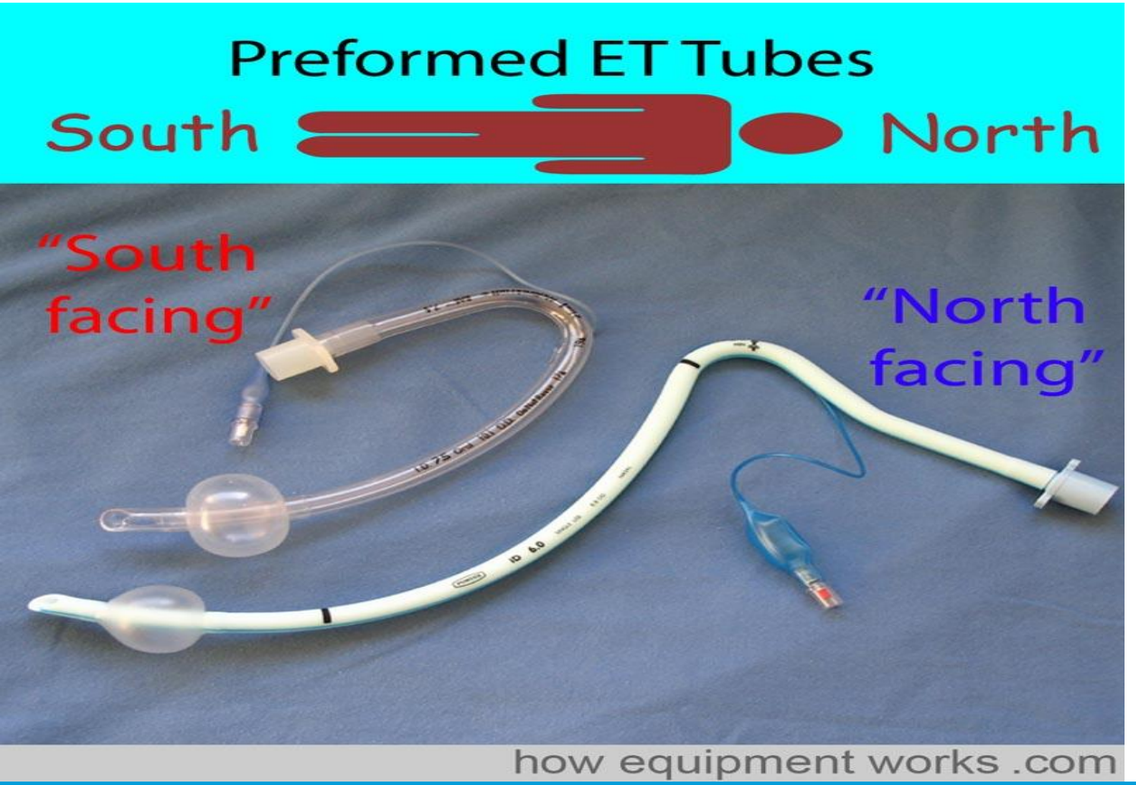


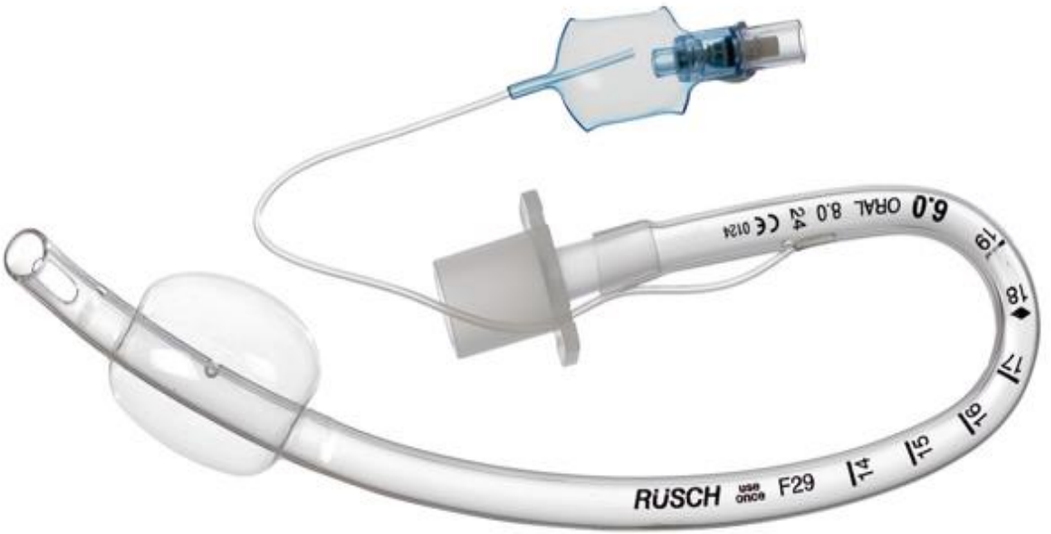
Fig. 5.11 The Oxford tracheal tube, red rubber (left) and plastic (right).



4-RAE Tracheal tube:

- ✓ North –facing or South –facing
- ✓ Nasal or Oral
- ✓ Cuffed or Uncuffed
- ✓ The cuffed RAE tracheal tube has one murphy eye where as the uncuffed version has two murphy eyes
- ✓ Used mainly during anesthesia for maxillofacial surgery



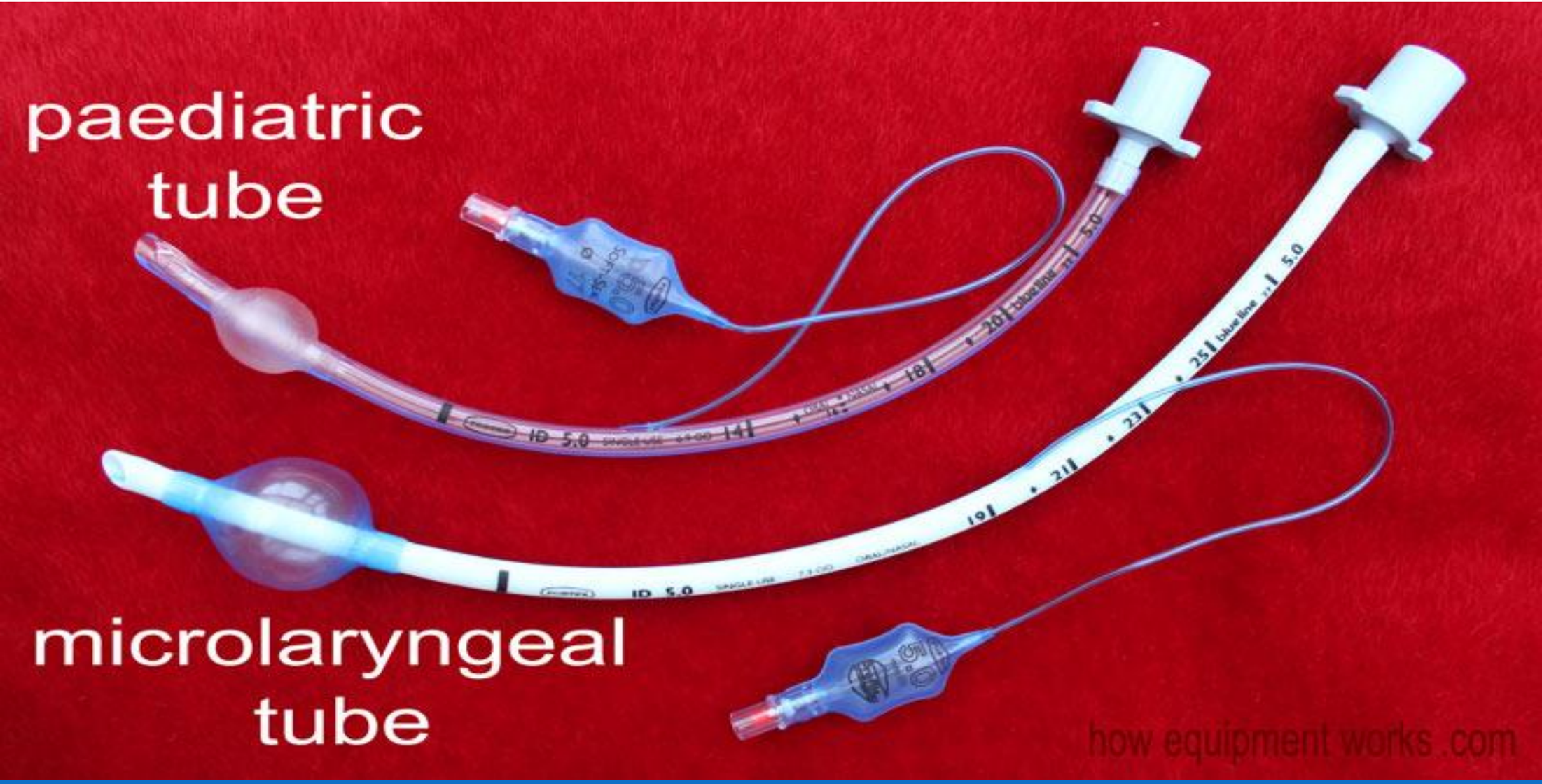


5-Laser – Resistant Tracheal tube:

- ✓ Used in anesthesia for laser surgery on the larynx or trachea
- ✓ The cuff is filled with methylene blue – Coloured saline

6-Micro Laryngeal Tracheal tube:

- ✓ This tube allows better exposure and surgical access to the larynx
- ✓ It has a small Diameter (usually 5 mm ID) with an adult sized length & cuff



7-Cole tube:

The Cole is a shouldered, uncuffed tube.

Uses

- Neonates (though less commonly than standard uncuffed tubes).

Advantages:

- The tube is tapered so that it has a wider diameter proximally than distally.This decreases kinking and reduces resistance to gas flow.

Disadvantages:

- The shoulder causes turbulence and may actually increase resistance to airflow.
- Tracheal injury may result if tube inserted too far

8-Microcuff tube:

The Kimberly Clark Microcuff tube has been specifically designed for paediatrics.

Uses:

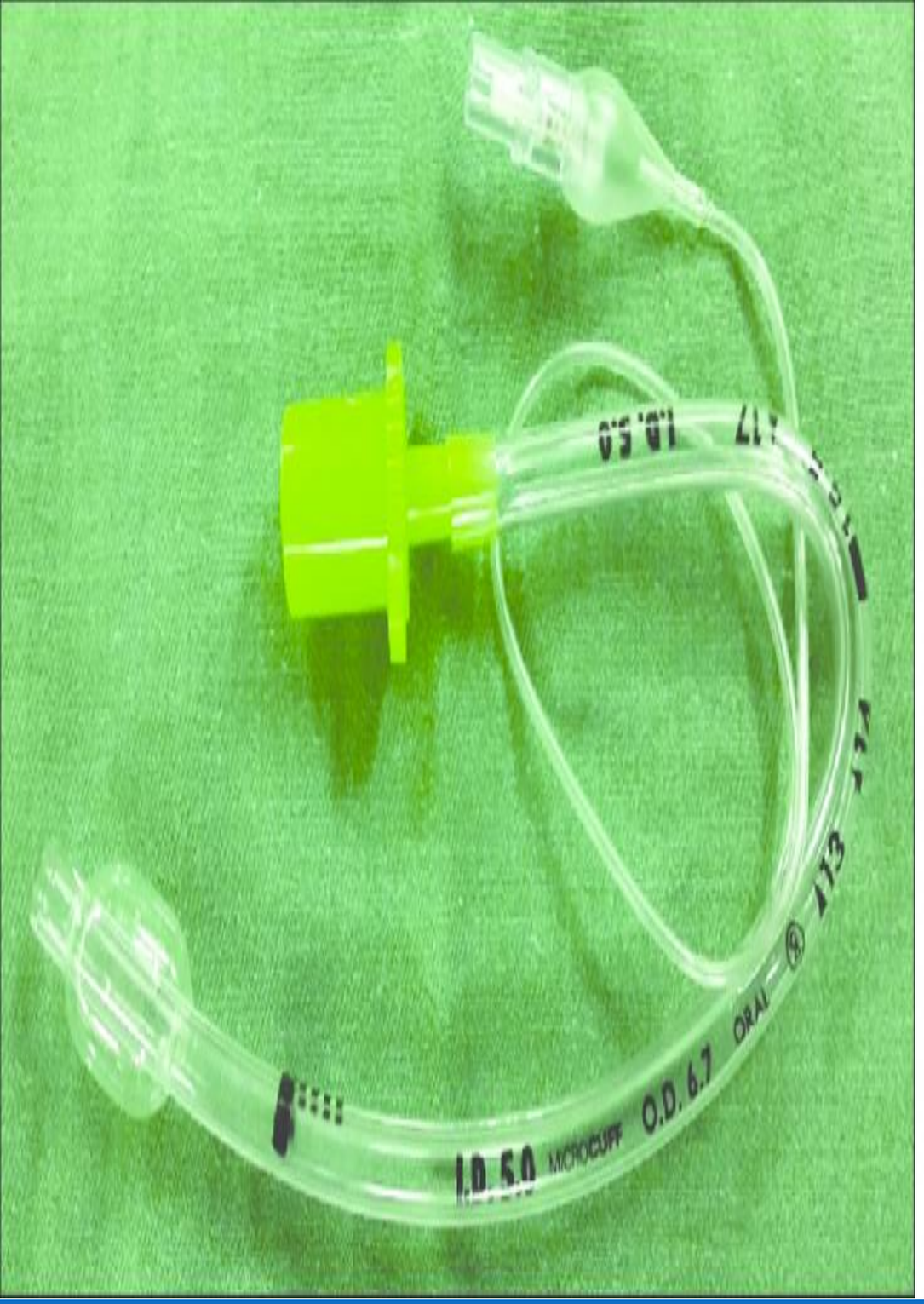
- Paediatrics.
- Adult versions may be used in place of cuffed tubes to reduce micro-aspiration risk.

Advantages:

- Specifically designed for pediatrics.
- Very low pressure, smooth cuff.

Disadvantages:

- Expensive.
- Smaller internal diameter than an uncuffed tube which may lead to increased blockage by secretions.


I.D. 5.0 MICROCUFF O.D. 6.7 ORAL


I.D. 8.5 Microcuff O.D.11.3 ORAL NASAL
8.5
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Thank You !