Instruments/ Devices commonly used in Pulmonary and Critical Care Medicine

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Ultrasonic Nebulizer

Principle of its use
Uses Peizo-electric crystals

At what frequency these crystals vibrate
At high frequencies (1-3 MHz).

Ultrasonic nebulizers deliver the medicine through high frequency vibrations in order to change the liquid medication into a mist. Portable, compact and battery operated, they work fast when compared to other nebulizers.

Limitations compared to jet nebulizers
They have large residual volumes and inability to aerosolize viscous solutions.

Jet Nebulizer

Principle of its use
Based on Bernoulli Principle.

What is the flow rate
These nebulizers require 2 to 10 L/min of pressurized gas to draw medication up through a capillary tube.

These are less expensive and are usually in the form of a plastic cup which holds the medication and allows the air pass through the tube with the help of the compressor.
Jet nebulizers require electricity to change a liquid into a mist.

What is the dose delivered by the nebulizers
Commercially available nebulizers deliver 12% to 20% of the nebulizer dose into the bronchial tree.

MESH NEBULIZER

Considered as the fastest working nebulizer and is more expensive.
Operates on a battery power supply and is quiet.
It generates the mono-disperse aerosol particles of 4.5 to 5µm.
It utilizes a vibrating membrane to generate the aerosol mist from the medication.
Mesh nebulizers are more efficient than jet nebulizers and can provide higher drug doses to patients.

Metered dose Inhaler

What are the Components
Canister ; propellant ; metering valve ; actuator (CAMP)

What is the propellant used
Conventional MDIs used CFCs as propellant but are now replaced by **Hydrofluroalkanes (HFAs)** that are ozone-safe.

How much amount of the drug is delivered
Only about **10%** of drug reaches the lungs.

Aerosols generated by MDI has a **'jet'** phase followed by a **cloud'** 'phase

SPACER DEVICE

These are one-way valved chambers **(11x4 cm or approx. 750ml volume).**

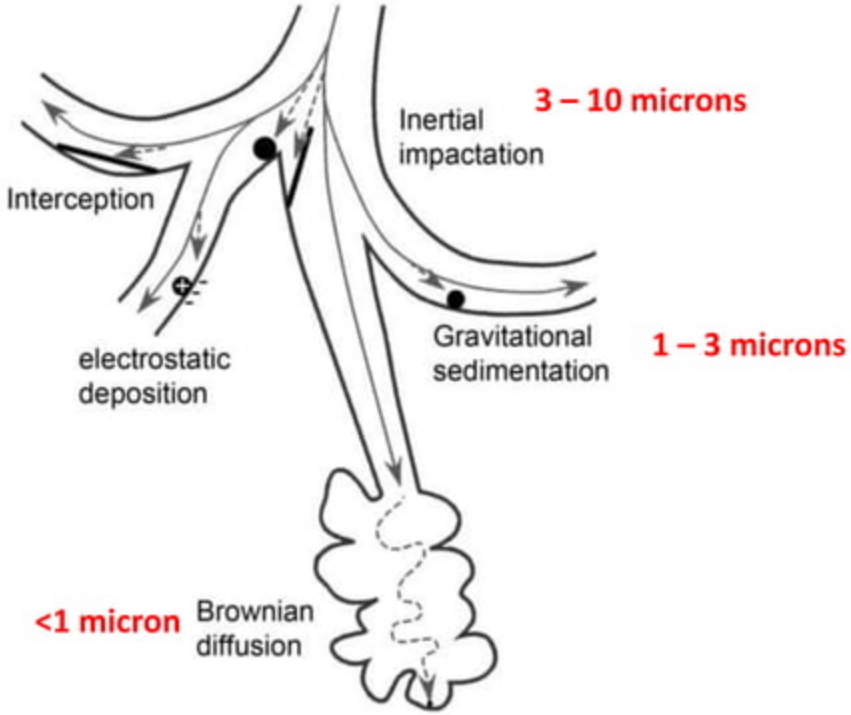
USE

Better drug delivery

Problem with cold CFCs depositing on the back of throat is less.

DRY POWDER INHALERS

- Less patient coordination required.
- Spacer not necessary.
- Built-in dose counter.
- Breath actuated.
- Compact, Portable.
- No propellant.
- Usually higher lung deposition than a MDI
- **Requires a minimum inspiratory flow rate of 28 Lt/min**


3 – 10 microns
Inertial
impactation
Interception
electrostatic
deposition
Gravitational
sedimentation
1 – 3 microns
<1 micron
Brownian
diffusion

DRUGS THAT CAN BE GIVEN BY INHALATIONAL ROUTE

- **Ant allergic agents**
  - Budesonide
  - Sodium Chromoglycate
  - Ketotifen
  - Clemastine

- **Bronchodilators**
  - β_2 agonist (short and long acting)
  - Anti-cholinergics
  - Theophylline

- **Anesthetics**
  - Opioids

Continued…

- **Antimicrobials**
  - Tobramycin
  - Pentamidine
  - Zanamvir
  - Amphotericin B
  - Ribavarin
  - Colistin
  - Aminoglycosides
  - Cephalosporins
  - Penicillins
  - Vancomycin

NASAL PRONGS

Oxygen Flow (L/min)	Approximate (FiO_2)*
1	0.21–0.24
2	0.24–0.28
3	0.28–0.34
4	0.34–0.38
5	0.38–0.42
6	0.42–0.46

Pendant Type

Moustache Type

What is the volume of reservoir
Around 20 ml.

Principle of reducing oxygen waste
During exhalation, the reservoir fills with O2. During inspiration, patient initially draws from the reservoir, then from the continuous flow of cannula. This acts to deliver a bolus of O2 early in the course of inspiration and also reduces O2 wastage during expiration.

Precision flow® (Vapotherm)

Optiflow system® (Fisher & Paykel)

High Flow Nasal Cannula

What are the components

Comprises an air/oxygen blender, an active humidifier, a single heated circuit and a nasal cannula.

Flow rate of oxygen delivery

It delivers adequately heated and humidified medical gas at up to 60 L/min of flow.

Physiological effects

Reduction of anatomical dead space, PEEP effect, constant fraction of inspired oxygen, and good humidification.

In what conditions is it used

Hypoxemic respiratory failure
Acute exacerbation of chronic obstructive pulmonary disease
Post-extubation
Pre-intubation oxygenation
Seep apnea
Acute heart failure
Patients with do-not-intubate.

SIMPLE FACE MASK

Can deliver higher O2 flow rates and entrain less room air compared to nasal cannula, hence can generate a higher FiO2. Flow rates for simple face mask should never be <5L/min as CO2 rebreathing may occur.

RE- BREATHER RESERVOIR MASK

Simple face mask + reservoir bag .

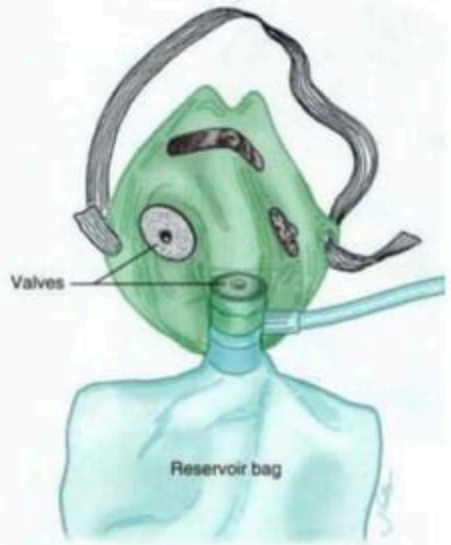
Volume of the reservoir

600-800ml

Different types

In partial rebreather, patient exhales 1/3rd of expired tidal volume into the reservoir.

Partial Rebreathing System



Non Rebreathing System

In non re-breather mask – 2 valves -**1)** A valve incorporated into the exhalation port that prevents entrainment of room air during exhalation **2)** A valve placed between reservoir bag and mask that prevents retention of exhaled gas during expiration.

VENTURI MASK

What principle it works
Works on **Bernoulli's principle**

Why it is considered in High Flow systems
It mixes room air with a precise amount of oxygen thereby delivering a precise FiO2.
The mask is so constructed that there is a constant flow of room air blended with a fixed concentration of oxygen.

Various color - coded jet adapters.

Each color code corresponds to a precise oxygen concentration and a specific liter flow.

Color	FiO2	O2 Flow
Blue	24%	2 L/min
White	28%	4 L/min
Orange	31%	6 L/min
Yellow	35%	8 L/min
Red	40%	10 L/min
Green	60%	15 L/min

Oxygen Concentrator

Oxygen concentrators are powered by plugging in to an electrical outlet or by battery.
Uses compressor to draw room air into the system.
Cools the air using heat exchanger
Passes the air into molecular sieve beds containing **granular zeolite crystals** composed of array of small particles which separate gases according to size.
Oxygen is isolated and sent to Product tank where it is pressurized at **10psi** and is then passed through bacteria filter and flow meter.
Provides FiO2 of **97-95% @ 2Lt/min** and **86-93% @ 4-5 Lt/min**

What are oxygen conserving devices

These devices are triggered by the onset of inspiration and deliver oxygen in boluses

What are the types

2 Types

Pulse type devices – fixed volume of oxygen is delivered based on flow settings

Demand type devices – the volume of oxygen is delivered throughout the whole inspiratory cycle , hence as respiratory rate decreases the amount of oxygen conserved is also decreased

Oxygen Cylinder

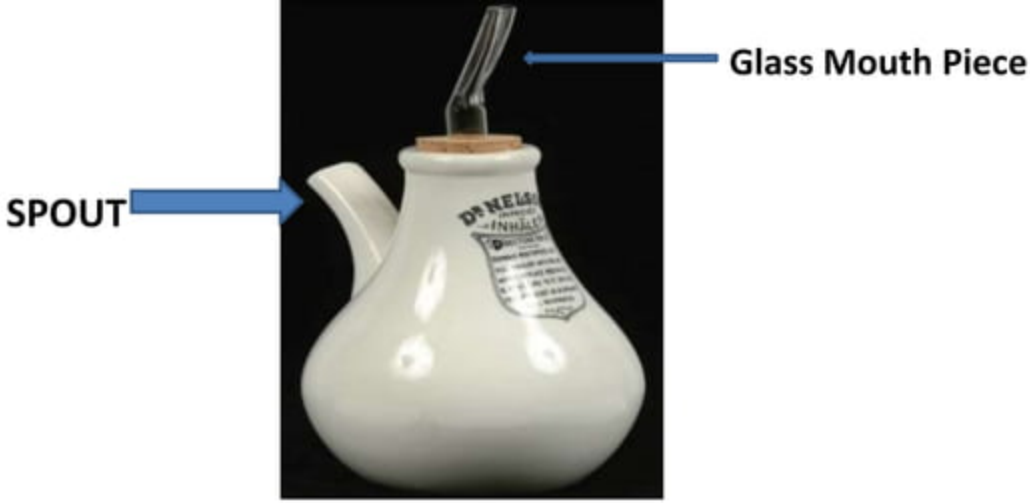
How to identify
Black Body and White Shoulder

Oxygen Is stored in cylinders at a pressure of – ***1800 - 2000 psi (1870)*** with a capacity of ***700 Lt.***

Pressure of Oxygen in the lines in Wards – ***55 psi.***

capacity of oxygen in main plant – ***6000 – 8000 liters*** at a pressure of ***1800-2000 psi***

DEVICE	FLOW RATES	FiO2 Delivered
Nasal Cannula	1- 6 Lt/min	24 – 44 %
Simple face mask	6 – 12 Lt/min	35 – 60 %
Partial Re-breather mask	8 – 15 Lt/min	50 – 60 %
Non-rebreather mask	10 – 15 Lt/min	80 – 90 %
Venturi mask	Upto 15 Lt/min	Upto 60%
High Flow Nasal Cannula	1 – 60 Lt/min	
High Flow generators	40 – 60 Lt/min	



NELSON'S INHALER

Fill the inhaler to a level below the spout with boiling water.
The water should remain just below the spout.

If the inhaler is filled up to the level of spout there is possibility of drawing water into the mouth when inhaling.

Cover the mouth piece with a gauze piece (**to prevent burns of the lips**) and plug the spout with a cotton ball (**prevents escape of steam**).

The glass mouthpiece is inserted in the cock such that it faces away from the spout.

Patient inhales through mouth and exhales through nose

DRUGS USED –
Tincture benzoin
Methanol
Eucalyptus
Pine

COPE'S PLEURAL BIOPSY NEEDLE

A – Hollow Beveled trocar
B – Stylet
C - Outer needle: 10 GA, square cut, tapered point.
D – Hollow, blunt – tipped, hooked biopsy trocar

Stylet is introduced into the **beveled** trocar which is then introduced into the **outer cannula** and the apparatus is inserted in pleural space.

The stylet and trocar are then removed and replaced by **biopsy trocar**

Abrams pleural biopsy needle

A – Inner Cutting Needle
B – Stylate
C – Outer Trocar

Stylet is placed in inner cannula which in turn is placed in outer trocar

Atleast 4 separate specimen should be obtained. Three should be placed in 10% Formalin for HPE and fourth in saline for testing for tuberculosis

Any other needle for the purpose ??

1 2 3 4 5

Intercostal Drains

1 – Angled tube ; **2 –** Straight Tube ; **3 –** Malecot's Catheter ;
4 – Assembled Trocar chest tube; **5** - The tube and its stylet

Malecot's Catheter

Made of India rubber.

It has flower at one end with 2 straight and 4 curved petals.

The curved petals can be straightened with an introducer for the insertion of the catheter.

Choosing the size of the tube

1) Malignant effusion for pleurodesis - **10 -14 F**
2) Hemothorax - **28 – 32 F**
3) Pneumothorax - **8 – 14 F**
4) Empyema - **24 – 28 F**

Site of insertion

1) Triangle of safety (Mid Axillary Line) – 4th or 5th ICS

Lateral border of Lattisimus dorsi
Lateral border of Pectoralis major
Horizontal line passing through apex of axilla

2) Mid clavicular Line – 2nd ICS

Direction of Tube

1) **Pneumothorax** –Anterior and superior
2) **Fluid –** posterior and inferior

Under water – seal drainage bag

Made of PVC
1000 ml capacity

It is a one bottle system

One – Bottle Collection System

•Serves as both collection chamber and water seal.

•Chest tube is connected through a rigid straw inserted into the sterile bottle.

•Rigid straw should be approx 2 cm below the saline.

•Bottle has a vent to prevent pressure from building when air/fluid escapes. Vent is provided with a cap which should be removed always.

When pleural pressure is positive, pressure in the rigid straw is positive and when this pressure is greater than the depth to which straw is inserted into the saline, air/fluid will enter the bottle.

Air will be vented out and liquid collects in the bottle.

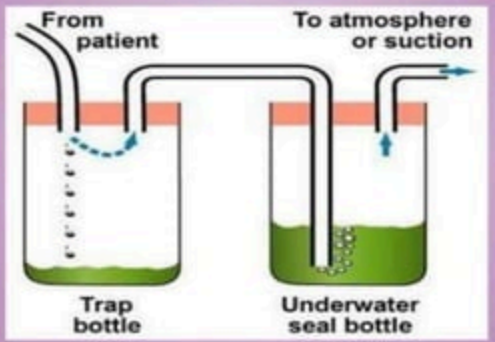
When pleural pressure is negative, fluid gets drawn up from the bottle into the straw and no extra air will enter the pleural space. That's why this is called as the **WATER SEAL.**

DISADVANTAGES

•When level of fluid rises in the bottle, pressure should be much higher in the rigid straw to allow additional air/fluid to exit from pleural space.

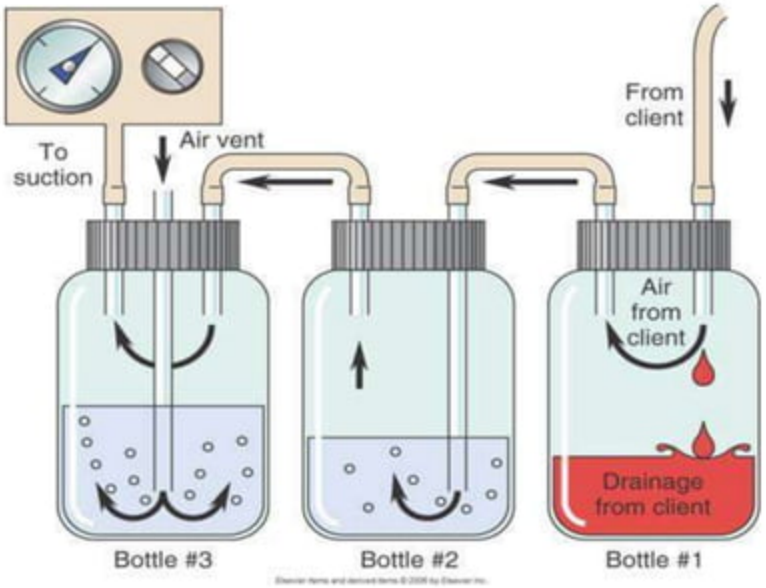
•If bottle is placed above level of patient chest, fluid can flow back to pleural cavity.

Two Bottle System



This system is preferred to one-bottle system when substantial amount of liquids are draining from the pleural space.

In this system, the bottle adjacent to the patient acts as collection bottle for the drained fluid and second bottle provides the water seal and air vent.



This system is used when controlled suction (negative pressure) of **-15 to -20 cm H2O** needs to be applied to facilitate re-expansion of the lung.

Though suction can be applied to the vent on a one- or two- bottle system also, but in many facilities the suction is provided by the wall suction in which the level of suction is not controlled.

Bottle 1 – Collection bottle
Bottle 2 – Water seal Bottle
Bottle 3 – Suction control bottle

Vent on suction control bottle is connected to the vent on water seal bottle.
Suction control bottle also has a rigid straw similar to that in water seal bottle.

When suction is applied through suction control bottle, air enters this bottle through the rigid straw, when the pressure inside the bottle becomes negative than depth to which straw is submerged in saline.
Hence, as long as bubble are emerging the negative pressure in the suction bottle is equal to the depth to which rigid straw is submerged.

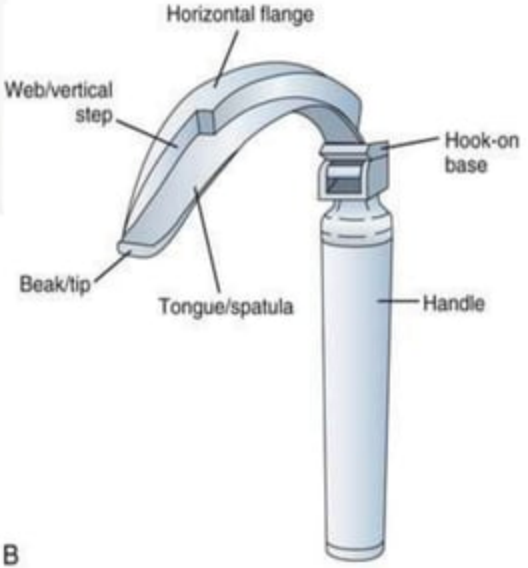
The same pressure exists in the water seal bottle as the two bottles are in direct communication.
In water seal bottle the rigid straw is immersed at same 2 cm below the saline.

So pressure in the drainage/ collection bottle is 2 cm H2O less than the other two bottles.

LARYNGOSCOPE

Macintosh

Miller

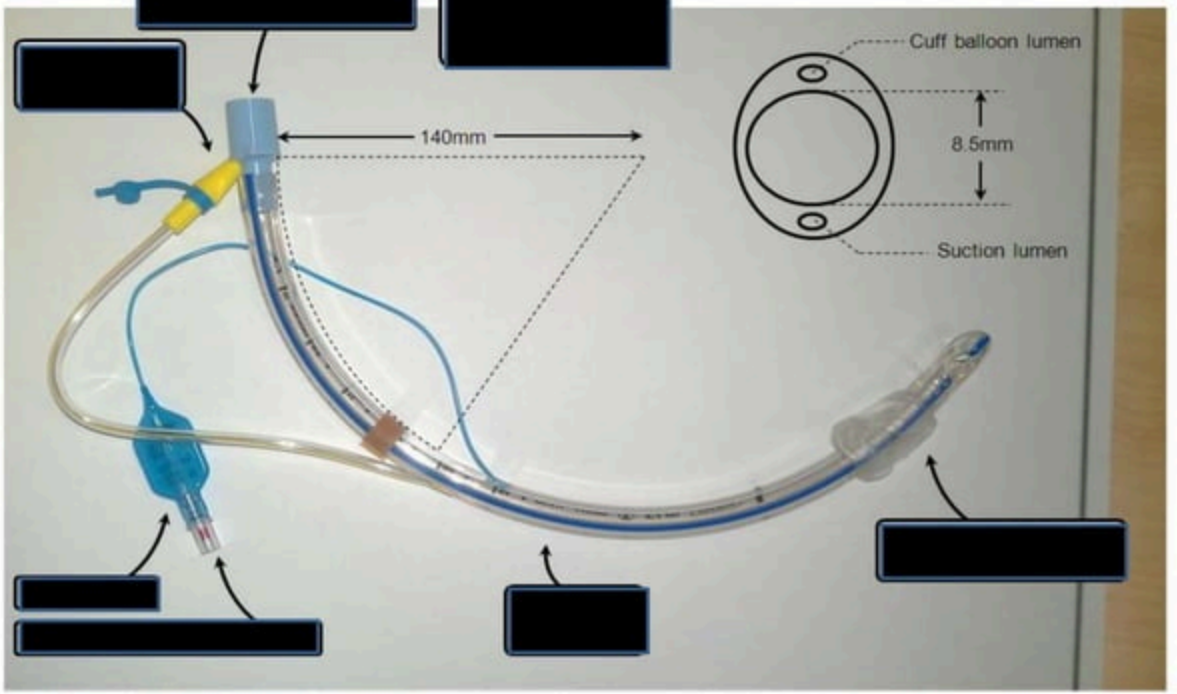


B

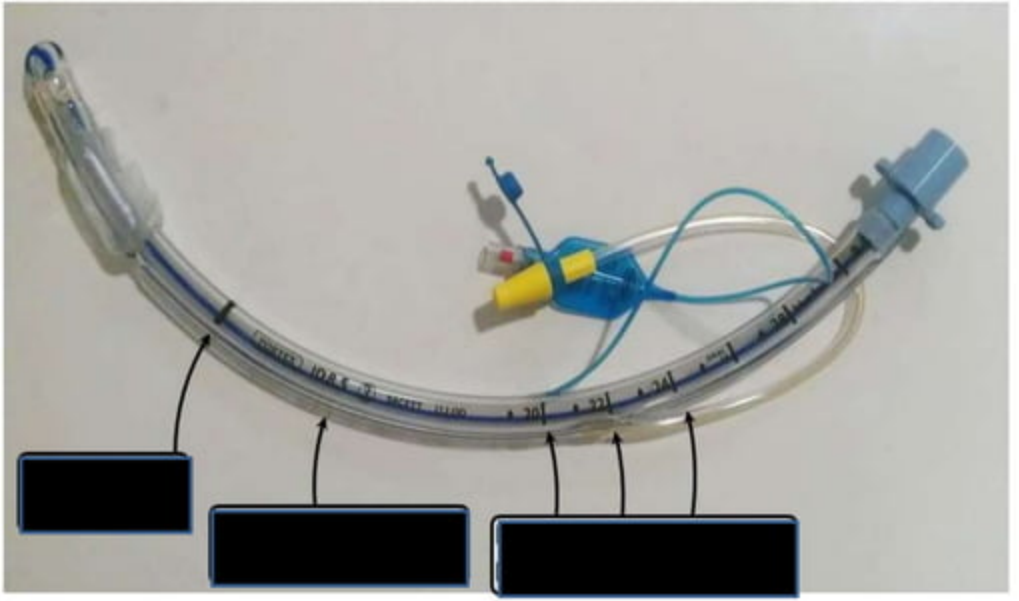
Macintosh is the most commonly used
Millers laryngoscope is designed to lift the epiglottis directly and is particularly useful in case of a large, floppy or irregular epiglottis

McCoy Laryngoscope – Modified Macintosh
It has an adjustable tip that can be operated by a lever at the handle

In case of difficult mouth opening – **Bizzarri – Giuffrida blade** – Modified Macintosl

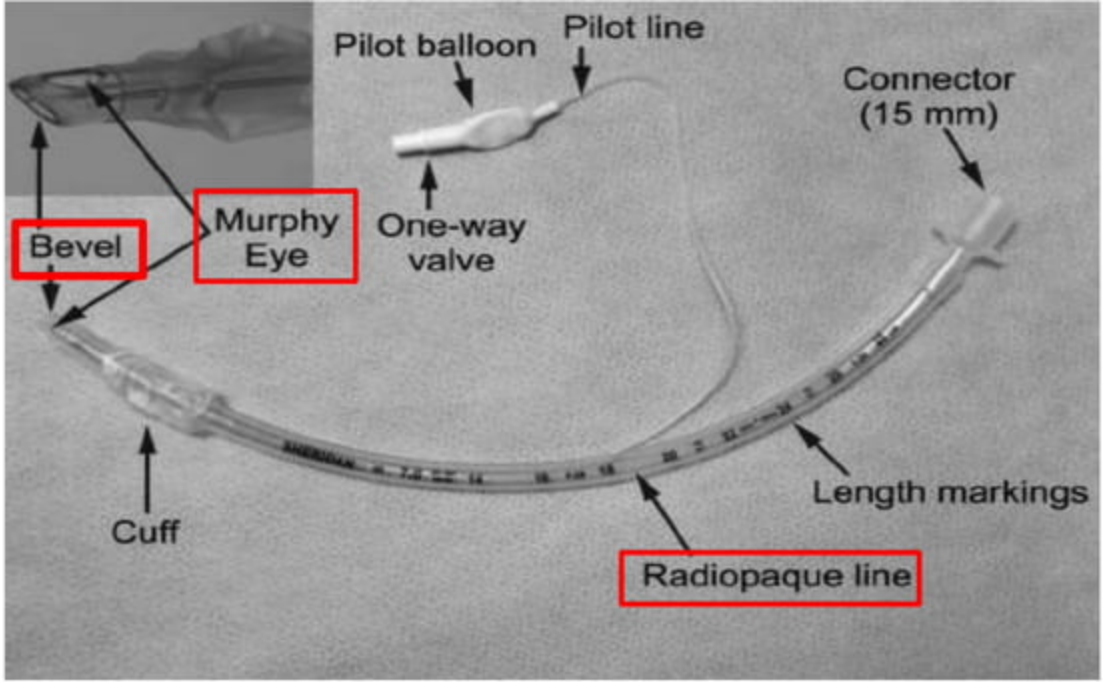


Size generally used for males – **7.5 or 8 mm**
Size generally used for females – **7 or 7.5 mm**
Incidence of sore throat and hoarseness of voice is greater with tubes of size **> 7mm**



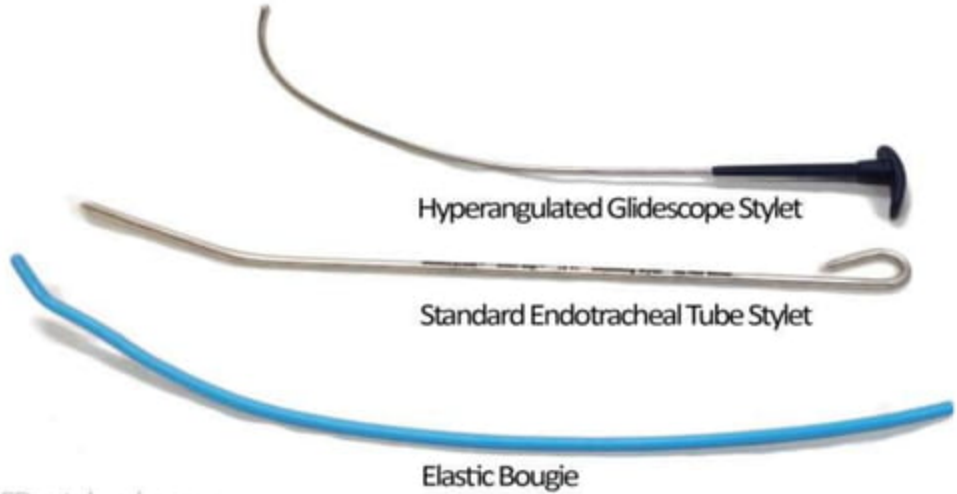
What is the material of the ETT

Red rubber or PVC (Routinely used) ; Silicon rubber ; Teflon



BEVEL - Patient's end is cut obliquely called as Bevel. Bevel faces to the left and facilitates the visualization of the cords

MURPHY EYE – it is a hole opposite to Bevel. It provides an alternative pathway for gas flow should the bevel gets occluded. Its area should be atleast 80% of cross sectional area of tube lumen.



Alters the shape of an ETT to facilitate intubation
Stiffens the ETT to aid passage into the trachea

How to confirm the correct placement of ETT

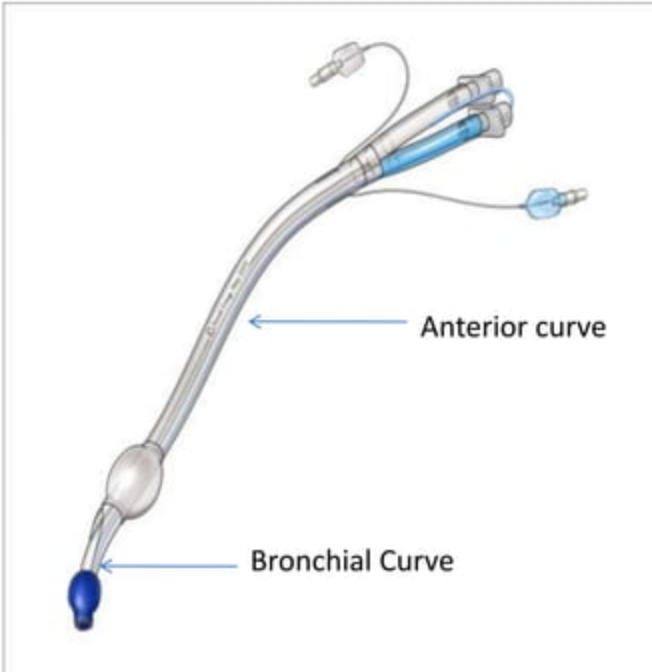
1) Direct visualization of tube passing through vocal cords
2) Capnography
3) Chest wall rise with inspiration
4) Auscultation of chest wall
5) Absence of gastric distention
6) CXR
7) FOB

Uncuffed ETT

Uncuffed ETT is used in children because the narrowest part of airway is cricoid, so inflating cuff can exert pressure on tracheal epithelium and cause tracheal necrosis

Double Lumen ETT

It is essentially two single lumen tubes of different lengths bound together and are termed right or left sided depending on which main stem bronchus the tube is designed to fit.



The **shorter tubes** terminates above the carina while **longer tube** extends into main stem bronchus.

Tube has 2 curves – anterior (fits into oropharynx-laryngotracheal curvature) and bronchial curve

Right side DLT is used for surgery on left lung where left lung needs to be collapsed with continued ventilation of right lung.

Left side DLT is used for surgery on either right or left lung.

Left side DLT is can be used for surgery on left side lung because of risk of occlusion of right upper lobe bronchus with cuff of right side DLT

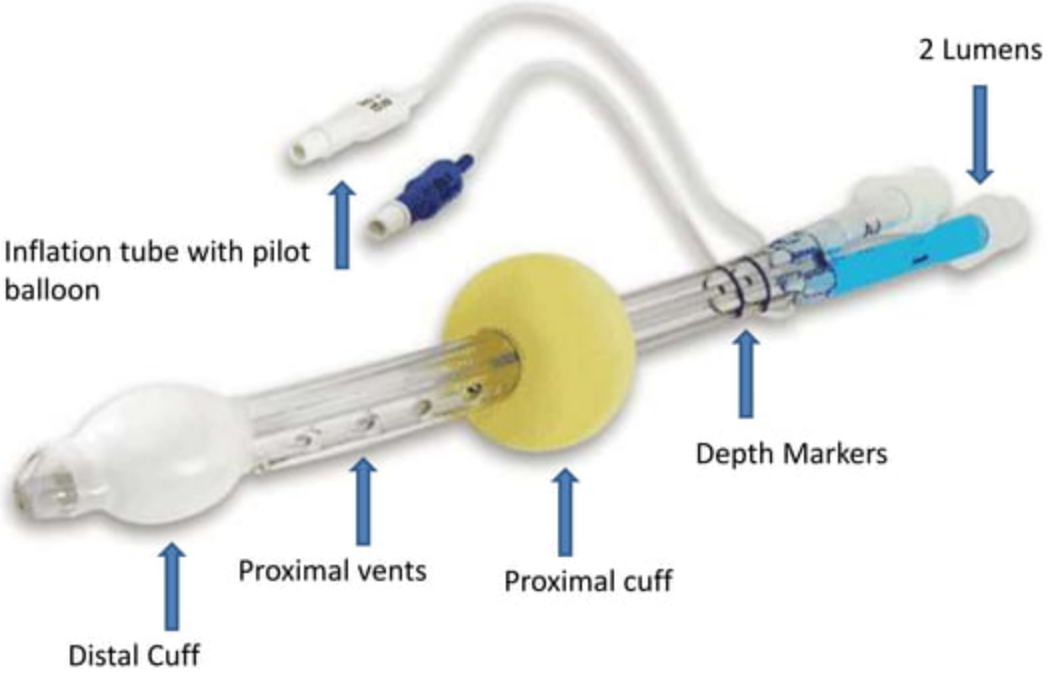
SIZES : 35 F (Females) ; 37 and 39 F (Males)

Complications

Hypoxemia ; Trauma ; Tracheo-bronchial rupture

Other Methods of one lung ventilation

Bronchial blockers
Single lumen endo bronchial tubes


2 Lumens
Inflation tube with pilot balloon
Depth Markers
Proximal vents
Proximal cuff
Distal Cuff

Combitube

Combitube is a double lumen tube that allows blind placement in either the trachea or the esophagus.

It is a single use device.

This device is used for emergency airway management.

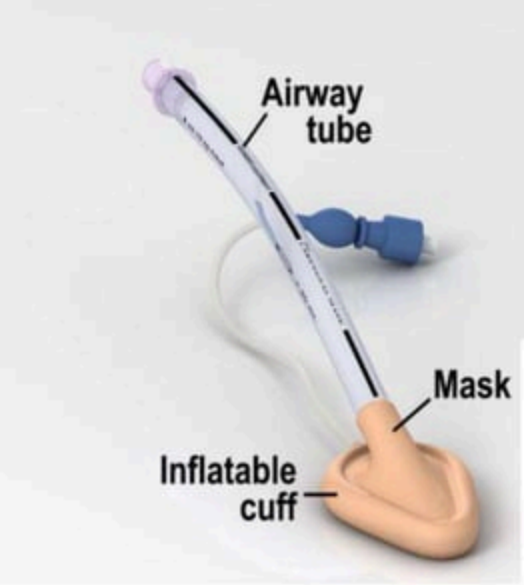
When inserted blindly, tube enters the esophagus in 95% of the cases.

When Tip is in esophagus, Distal Cuff seals off the esophagus and prevent aspiration
Proximal cuff seals the pharynx.

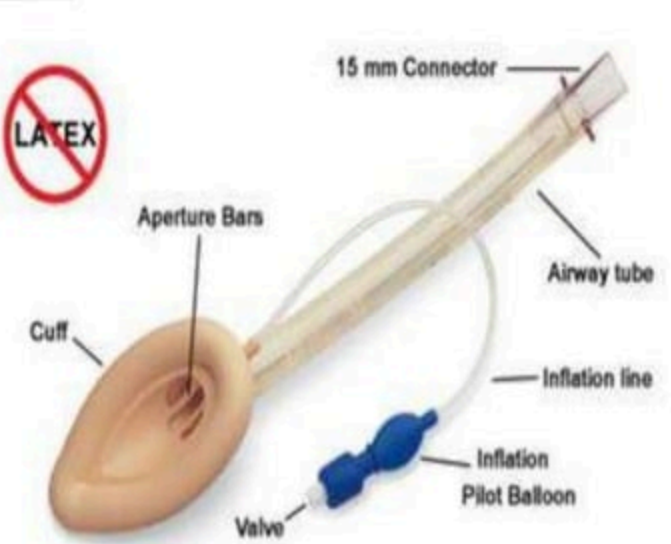
Ventilation is always done through the **BLUE** lumen first. Air escapes through the 8 Ventilating Ports.

If ventilation through the Blue lumen is not possible, it suggests that distal tip is in trachea, in that case ventilate through the white lumen.

SUPRAGLOTTIC DEVICES



Classic LMA



ProSeal LMA

I Gel supraglottic Airway

Classic LMA

Provides more secure and reliable means of ventilation compared to facemask

Can be easily inserted by paramedical staff

Can be used in patients with abnormal facial contour

Not absolute protection against aspiration

Used only with low pressure ventilation

Contraindicated in patients at risk of acid aspiration

ProSeal LMA

Designed especially for use with PPV at higher pressures

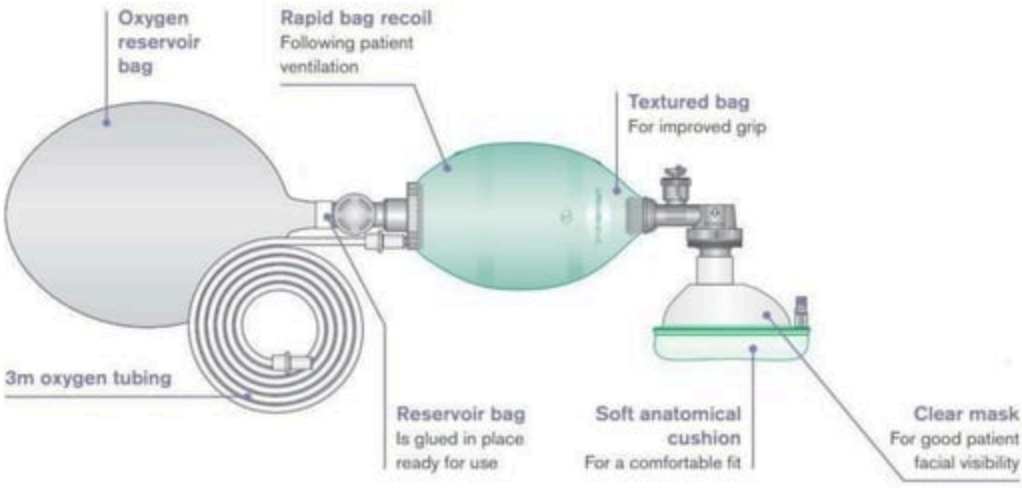
I Gel airway

Soft, gel-like, cuffless supraglottic airway

It creates a noninflatable seal of pharyngeal and laryngeal structures

Because of noninflatable cuff, risk of tissue compression is minimal

AMBU


Oxygen reservoir bag
Rapid bag recoil
Following patient ventilation
Textured bag
For improved grip
3m oxygen tubing
Reservoir bag
Is glued in place ready for use
Soft anatomical cushion
For a comfortable fit
Clear mask
For good patient facial visibility

AMBU – Artificial Manual Breathing Unit
Air Bag Mask Unit

Using Ambu Bag to ventilate patient is called as **Bagging**
Word AMBU came from **Ambulance**
Provides a volume of **6-7 ml/kg/breathe**

TECHNIQUE

Sniffing Position – Flexion of lower cervical spine (35 degrees) and extension of head (15 degrees) at atlanto-occipital joint.

Thumb + Index finger to maintain the face seal.
Ring, Little & Middle finger under the angle of mandible

Made of **silicon Rubber**

Supplied with Mask ; Oxygen Reservoir ; Oxygen Tube

Adult Size Ambu Bag

Balloon Capacity – **1500 ml**
O2 Reservoir Capacity – **2600 ml**
Face mask Size – **4 / 5**

During CPR – Give 30 chest compressions followed by 2 breaths till an advanced airway is placed.

Then ventilate at a rate of 5-6 breaths/min – **one breath per 10 seconds**

TYPES OF BAGS USED

1) Flow Inflating Bag

Fills only when oxygen from a compressed source fills into it.
Requires a tight face-mask seal to inflate
Uses a flow-control valve to regulate pressure-inflation
Delivers **100%** oxygen at all times

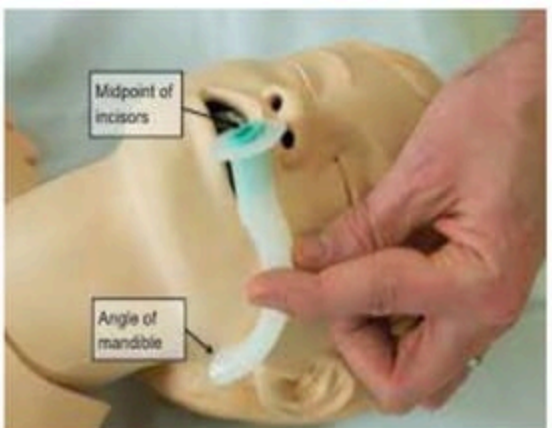
2) Self-Inflating Bag

Fills spontaneously after they are squeezed
Remain inflated at all times
Can deliver PPV without a compressed gas source
It has a pressure release valve set at 30-40 cm H20
Oxygen concentration supplied –

21% - Ambu not connected to O2 or reservoir
40-60% - Ambu connected to O2 source of 5 – 10 Lt/min flow
100% - Ambu connected to reservoir and 15 Lt/min of flow

Guedel Oropharyngeal airway

Nasopharyngeal airway



Tip of the nose to the tragus of the ear + 1 inch

Oropharyngeal airway (Guedel)

- Made of rubber / Plastic
- It has gentle curve that follows contour of the tongue
- It has tubular channel for air exchange and suction
- Open patient's mouth and insert it with curvature facing the upper lips and once it is halfway down, rotate it and advance till distal end lies in the Oropharynx

Nasopharyngeal airway

- Made of soft plastic, polyurethane or latex rubber
- At its proximal end is a **Flange** that limits its insertion upto the just above epiglottis
- Nasal airway is better tolerated in semi-awake patient and has less chances of accidental removal compared to oral airway

Volume Incentive Spirometer

Flow Incentive Spirometer

Incentive spirometry, also referred to as **Sustained Maximal Inspiration.**

The patient is instructed to hold the Spirometer in an upright position, exhale normally, and then place the lips tightly around the mouthpiece.

The next step is a slow and deep inhalation & hold the breath (upto 6 sec)

To raise the ball (flow-oriented) or
The piston/ plate (volume-oriented) to the set target.

FREQUENCY

- 10-15 breaths every one to two hours while awake
- 10 breaths, 5 times a day

INDICATIONS

- As a part of Respiratory therapy that lower the incidence of postoperative pulmonary complications.
- Presence of pulmonary atelectasis or conditions predisposing to the development of pulmonary atelectasis (Upper-abdominal or thoracic surgery, Lower-abdominal surgery, Prolonged bed rest, Pneumonia)

For Flow Incentive Spirometry

Ball Color	Chamber
Red	600 ml
Yellow	900 ml
Green	1200 ml

As patient breathe in, balls in the column moves up. The height of the balls shows how much air patient breathed in or inhale.

If the Red ball is kept afloat for 1 second, the inspired volume(Maximum amount of air that can be drawn into the lungs) is approx 600 ml

For Volume Incentive Spirometer

Inhale through the mouth piece of the device.
The large piston rises, indicating the volume of air inhaled.
There is a yellow indicator to prescribe the volume of air to be inhaled with each breathe.

Another small piston moves between the faces drawn on the device.
It is called the **Inspiratory Coach.**
It measures the **rate** at which the patient breathe in.

Patient should inhale slowly and deeply at a rate such that the inspiratory coach is around the happy face.

The device also has a one way valve so as to only allow for inhalation only also keeping inside of the device clean.

Acapella device

Vibratory PEP therapy

Combines **vibratory therapy** by which airflow vibrations loosen and disengage trapped mucus and **PEP therapy** which creates a force that splints airway open during exhalation and pushes air behind mucus promoting the movement of the mucus towards the large airways.
AS patient inhales, the valve inside the device allows the air to enter in when pt exhales the valve closes and PEP is created. As the pressure increases the expiring air forces the vibrator to vibrate.

Uses an oscillation which provides vibration within airways which helps to loosen the mucus
In combination with this oscillation there will be resistance to expiratory flow

It is used for airway **mucus clearance in conditions such as**
Chronic bronchitis, asthma, bronchiectasis, CF, Atelectasis, Mucociliary clearance disorders

FIBREOPTIC BRONCHOSCOPE

1) **Eye piece:** Can be attached to a camera for display on screen. fiberoptic scopes have an eye piece; video scopes do not.

2) Diopter ring for focusing

3) Control lever: Controls the tip. Only permits movement in a vertical plane.. Moving the lever down, moves the tip up and moving the lever up, points the tip down.

4) Working channel port: For suction, instillation of local anesthetic, oxygen delivery.

7) Light source: Can be a portable battery powered source or via a cable. Light source may be halogen, incandescent or LED.

8) Suction valve and port

Total Length of the FOB	**– 900 mm**
Length of working channel	**– 600-650 mm**
Outer diameter	**– 6.0 mm**
Working channel	**- 2.8 mm**

ANAESTHESIA

Oropharynx is anesthetized with 4% xylocaine or nebulize with 4% xylocaine for 15-20 minutes with jet nebulizer.

In nasal approach, bronchoscope is lubricated with 2% xylocaine gel.

In oral approach, patient is asked to bite gently the mouth guard and bronchoscope is then inserted through this mouth guard into the posterior pharynx to the level of epiglottis.

Vocal cords are anesthetized by 2ml of 1% xylocaine.

When bronchoscope is in the trachea, further 2 ml of 1% xylocaine is administered in trachea, carina and RMB & LMB

THERAPEUTIC INDICATIONS

- Pulmonary toileting
- Removal of foreign body
- Airway stent
- Management of air leaks
- Bronchial thermoplasty
- Endotracheal tube placement
- Management of hemoptysis
  - Laser/argon plasma coagulation
  - Electrocoagulation
  - Cryotherapy
  - Balloon dilatation
- Brachytherapy catheter placement
- Treatment of emphysema (valves and coils)

RIGID BRONCHOSCOPE

It is a straight, hollow metal tube
It has uniform diameter throughout its length
Lumen is circular

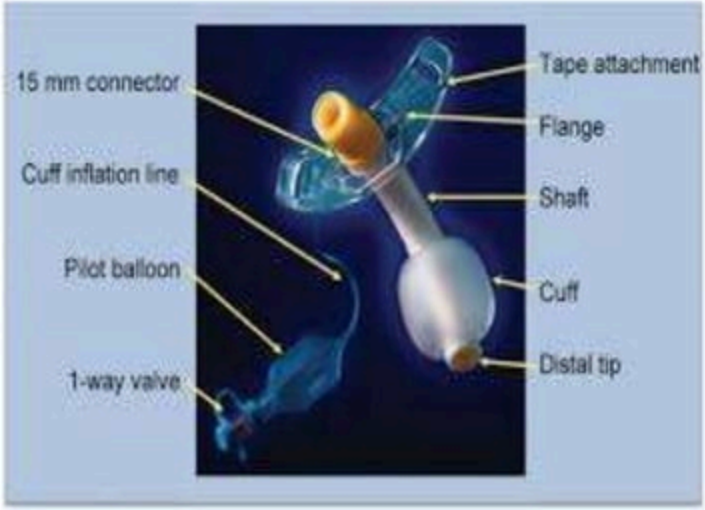
Wall thickness – **2-3 mm**
Diameter – **9 – 13.5 mm**
Length – **40 cm**

Distal end is beveled
Proximal end has several ports – For connection to anesthesia apparatus , suction catheters, ventilating equipments

THERAPEUTIC INDICATIONS

Massive hemoptysis	Dilatation of stenosis
Laser therapy	Stent insertion
Foreign body removal	Tumor resection
Cryotherapy	Electrocautery

Tracheostomy Tube



Tracheostomy tube may be of **Rubber or Portex**
They may be cuffed or Uncuffed

Portex tube has cuff which can be inflated by injecting air through the outer tube.
The balloon gets inflated and secures the Tracheostomy tube in position.
A plastic attached to the tube has ribbons which secures the tube around the neck.

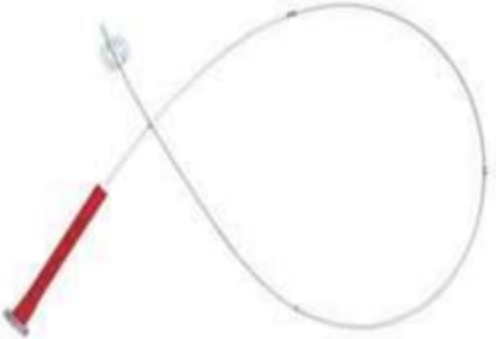
A metal tube is also available which is Uncuffed.
Metal tube is used when permanent Tracheostomy is required following laryngectomy.

Tracheostomy is considered when M.V is expected to be prolonged and who are unable to wean for > 10 days.

Equipments required –

- seldinger type needles
- dilators
- LA and Adr
- Guide wires
- Lubricating Jelly
- FOL / FOB

Tube is most commonly placed between **2nd and 3rd** tracheal ring



Fogarty Catheter

Fogarty catheter is used to remove fresh emboli in the arterial system.
It is also used for selective airway occlusion.

It consists of a hollow tube with an inflatable balloon attached to its tip.

Diameter of inflated balloon ranges from **5mm – 45mm**
Catheter size ranges from **3F – 8F**
Length ranges from **40cm – 80cm**

The catheter is inserted into the blood vessel through a clot.
The balloon is then inflated to extract the clot from the vessel.

Zephyr EBV (Pulmonx)

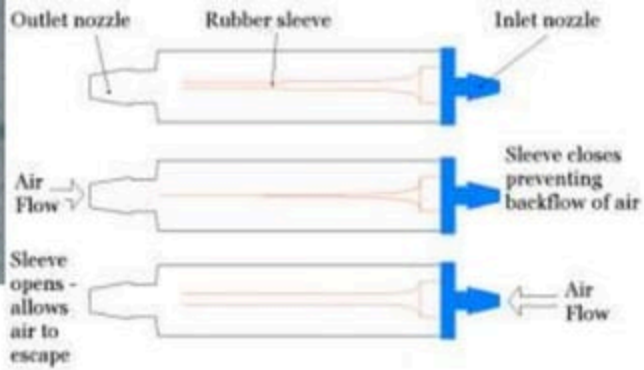
Spiration IBV (Olympus)

The EBV system generally consists of a delivery catheter, a loader system, a guidewire, and the implantable valves.
The valves are composed of a self-expanding framework made of nitinol. **Nitinol** is a titanium/nickel-based alloy commonly used in implantable medical devices, which has biological tolerance and the capacity to maintain its preformed shape.

There are currently 2 commercially available types of EBVs:
The Zephyr EBV® (Pulmonx)
The Spiration IBV® (Olympus Respiratory America)

First EBVs ever produced were the **Emphasys** which are not anymore commercially available.

USES
LVRS
Cessation of persistent air leaks



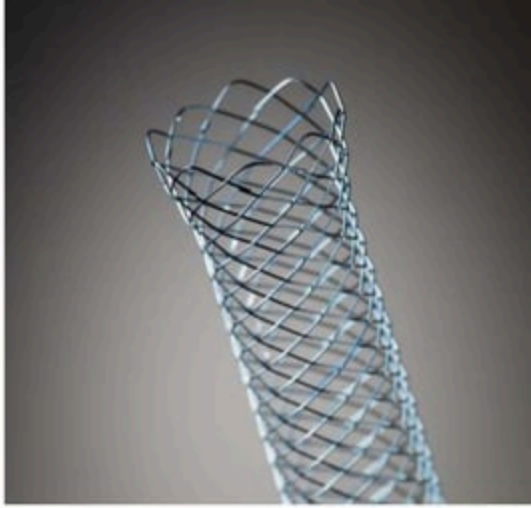
Heimlich Valve

- Used for the treatment of Air leaks When patient is stable and lung is >90% expanded with persistent leaks.

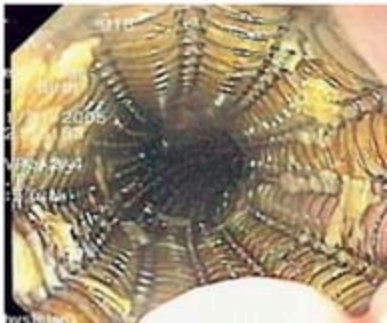
- It has a mechanical one-way valve
- Allows air to escape when pleural pressure becomes positive and also prevent air from entering into the chest as the valve closes when the pleural pressure becomes negative.

- It does not require water to operate
- Not position sensitive

Silicon Stent



Metallic Stent



Silicon Stents

Types –
Smooth walled Hood
Studded Hood

•Inserted under GA by Rigid Bronchoscopy.
•Well tolerated
•Do not break
•Easy to insert, reposition and remove
•Stent migration and occlusion with granulation tissue is common

Metallic Stent

Types –
Wall stent
Ultraflex stent

•They can be inserted under LA via FOB
•They are self expanding
•They resists external compression
Minimal migration

•Cannot be easily removed or repositioned
•Expansile force may rupture the airways
•They may get occluded with granulation tissue

WATANABE SPIGOTS

Endobronchial Watanabe Spigots are developed by NOVATECH.
They are made up of Silicon and are Radio-opaque
It is also known as **Bronchial Filler**

INDICATIONS

Intractable secondary pneumothorax
Air leaks or BPF
Peripheral bronchial bleeding

EWS are tapered and have an anatomical design with studs on the outside to avoid migration.

Available in 3 Sizes

After determination of the affected bronchi with a balloon catheter, the EWS are placed with a flexible bronchoscope and forceps guided.

The spigots can be removed after the patient's condition has improved and the thoracic drain is removed. If there are difficulties in removing EWS for any reason, removal is not necessary.

EWS were successfully placed in **96.7 %** of the cases. The loss of air was stopped or significantly reduced in **77.6 %** of the cases

To be continued with more devices / instruments….

THANKUU….