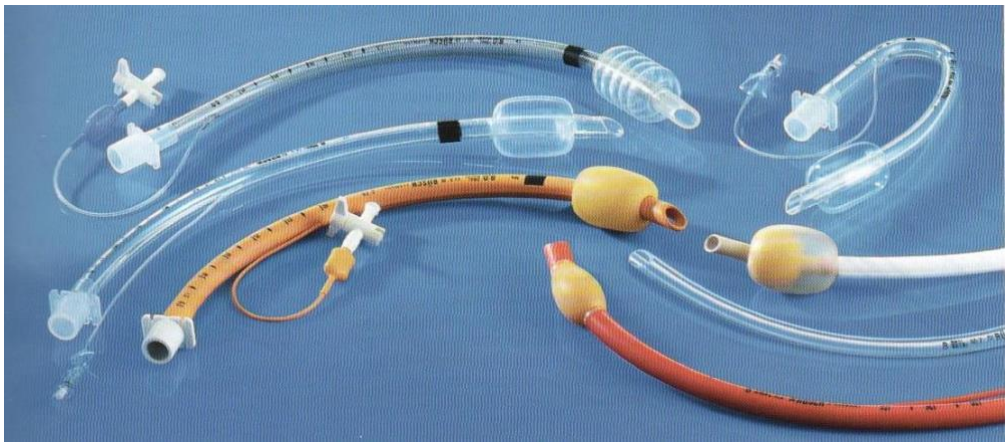
Tracheal and tracheostomy tube and airways

Tracheal tubes:



Tracheal tubes provide a means of securing the patient's airway. These can be made of either plastic (disposable) or rubber (reusable after cleaning and autoclaving). The plastic disposable tracheal tubes have a radio-opaque line running along their length , which enables their position to be determined on chest X-rays.

Features of tracheal tubes:

Size

1. The internal diameter is marked on the outside of the tube in millimeters. Narrower tubes increase the resistance to gas flow, therefore the largest possible internal diameter should be used. This is especially important during spontaneous ventilation where the patient's own respiratory effort must overcome the tube's resistance. Usually, a size 9mm internal diameter tube is selected for an average size adult male and a size 8mm internal diameter tube for an average size adult female. Paediatric sizes are determined on the basis of the age and weight.
2. The length (taken from the tip of the tube) is marked in centimetres on the outside of the tube. The tube should be cut down to size to suit the individual patient. If the tube is cut too long, there is a significant risk of it advancing into one of the main bronchi (usually the right one).

The bevel

1. The bevel is left-facing and oval in shape in most tube designs. A left-facing bevel improves the view of the vocal cords during intubation.
2. Some designs have a side hole just above and opposite the bevel, called a Murphy eye. This enables ventilation to occur should the bevel become occluded by secretions, blood or the wall of the trachea.

The cuff

Tracheal (oral or nasal) tube can be either cuffed or uncuffed. The cuff, when inflated, provides an airtight seal between the tube and the tracheal wall. This airtight seal protects the patient's airway from aspiration and allows efficient ventilation during IPPV.

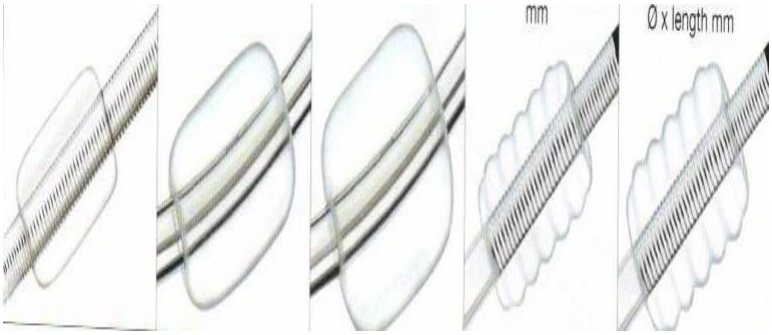
1. The cuff is connected to its pilot balloon which has a selfsealing valve for injecting air. The pilot balloon also indicates whether the cuff is inflated or not. After intubation, the cuff is inflated until no gas leak can be heard during IPPV.

2. The narrowest point in the adult's airway is the glottis(which is hexagonal). In order to achieve an airtight seal, cuffed tubes are in adults.
3. The narrowest point in a child's airway is the cricoid cartilage. Since this is essentially circular, a correctly sized uncuffed

tube will fit well. Because of the narrow upper airway in children, postextubation subglottic oedema can be a problem. In order to minimize the risk, the presence of a small leak around the tube at an airway pressure of about 15 cmH_2O is desirable. 4. Cuffs can either be:

a. High pressure /low volume

b. Low pressure /high volume



High pressure/ low volume cuffs

1. These can prevent the passing of vomitus, secretions or blood into the lungs.
2. At the same time, they exert a high pressure on the tracheal well. If left in position for long periods they may cause necrosis of the tracheal mucosa.

Low pressure / high volume cuffs

1. These exert minimal pressure on the tracheal wall as the pressure equilibrates over a wider area. This allows the cuff to remain inflated safely for longer periods.
2. They are less capable of preventing the aspiration of vomitus or secretions. This is due to the possibility of wrinkles forming in the cuff.

The pressure in the cuff should be checked at frequent and regular intervals. The pressure may increase due to diffusion of nitrous oxide into the cuff and expansion of the air inside the cuff due to the increase in its temperature from room to body temperature, or it may decrease due to a leak in the cuff or pilot balloon's valve.

Route of insertion

1. They can inserted orally or nasally.
2. The indications for nasal intubation include:

Dilation of the nose with nasal airways/lubricants/vasoconstricors

   a. Surgery where access via the mouth is necessary, e.g. ENT or dental operations.

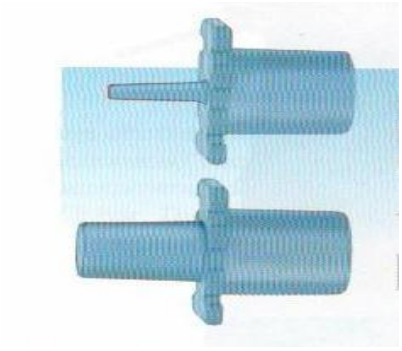
ETT insertion, along floor of nose

b. Long term ventilated patients on the intensive care units. Patients tolerate a nasal tube better and cannot bite on the tube. However, long term nasal intubation may cause sinus infection.

3. Nasal intubation is usually avoided, if possible, in children up to the age of 8-11 years. Hypertrophy of the adenoids in this age group increases the risk of profuse bleeding if nasal intubation is performed.

Connectors:

These connect the tracheal tubes to the breathing system (or catheter mount). These are various designs and modifications. They are made of plastic or metal and should have an adequate internal diameter to reduce the resistance to gas flow.



The British Standard connector has a 15mm diameter at the proximal end. An 8.5 mm diameter version exists for paediatric use. Connectors designed for use with nasal tracheal tubes have a more acute angle than the oral ones (e.g. Magill connector). Some designs have an extra port for suction.

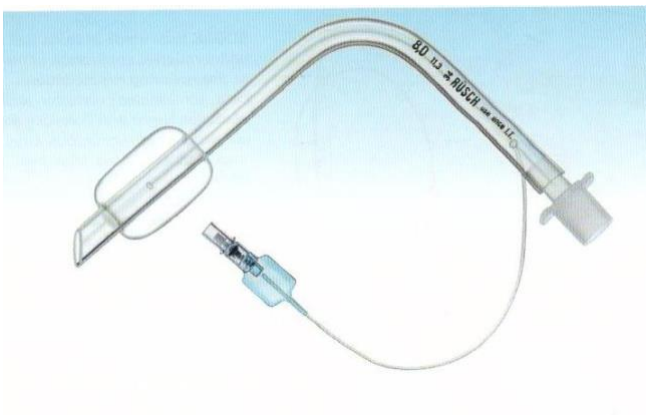
Problems in practice and safety features:

1. Obstruction of the tracheal tube by kinking, herniation of the cuff, occlusion by secretions, foreign body or the bevel lying against the wall of the trachea.
2. Oesophageal or bronchial intubation.
3. Trauma and injury to the various tissues and structures during and after intubation.

Specially designed tracheal tubes *Oxford*

tracheal tube:

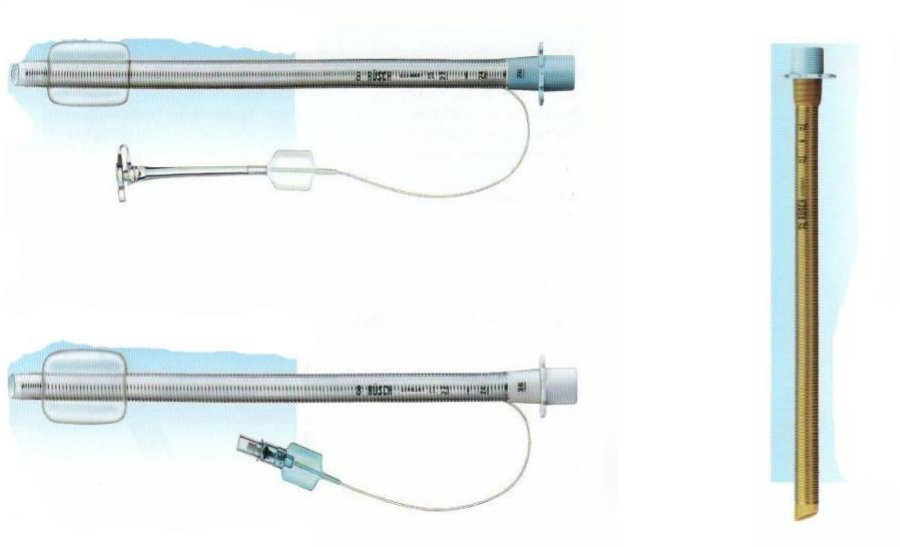
This anatomically L-shaped tracheal tube is used in anaesthesia for head and neck surgery because it is non-kinking. The tube can be made of rubber or plastic and can be cuffed or uncuffed. The bevel is oval in shape and faces posteriorly and an introducing stylet is supplied to aid the insertion of the tube. Its thick wall adds to the tube's external diameter making it wider for a given internal diameter. This is undesirable, especially in paediatric anaesthesia.



The distance from the bevel to the curve of the tube is fixed. If the tube is too long, the problem cannot be corrected by withdrawing the tube and shortening it because this means losing its anatomical fit.

Armoured tracheal tube

Armoured tracheal tubes are made of plastic or silicone. The walls of the armoured tube are thicker than ordinary tracheal tubes because they contain a spiral of metal wire or tough nylon. They are used in anaesthesia for head and neck surgery. The spiral helps to prevent the kinking and occlusion of the tracheal tube when the head and /or neck is rotated or flexed. An introducer is used to aid intubation.

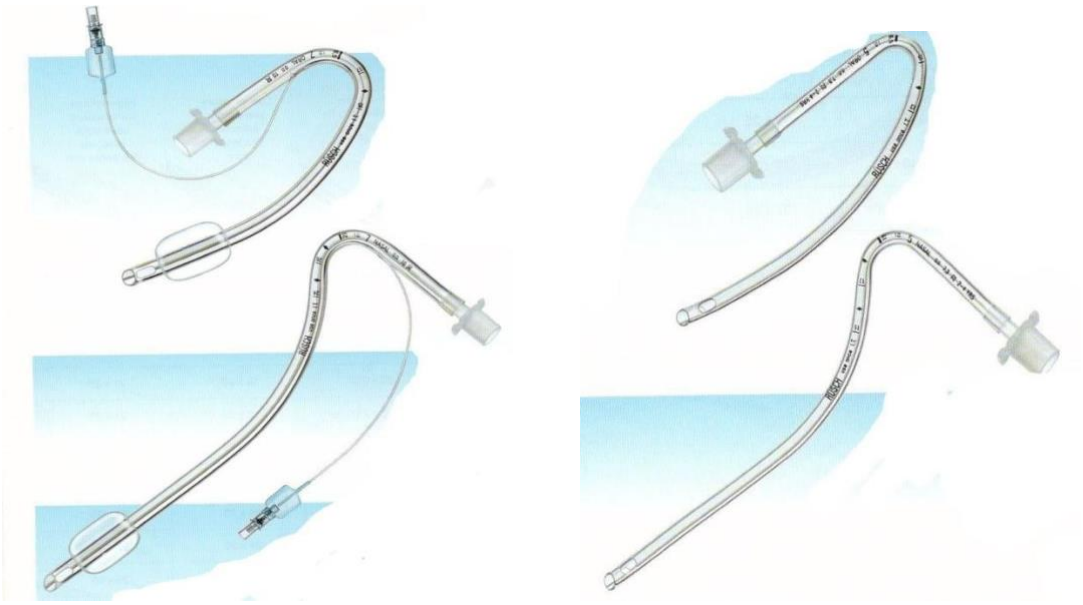


Because of the spiral, it is not possible to cut the tube to the desired length. This increases the risk of bronchial intubation. Two markers, situated just above the cuff, are present on some designs. These indicate the correct position for the vocal cords.

Polar and RAE tracheal tubes:

The polar tube is a north-facing nasal cuffed tracheal tube. It is used mainly during anaesthesia for maxillofacial surgery as it does not impede surgical access. Because of its design and shape, it lies over the nose and the forehead. It can be converted to an ordinary tracheal tube by cutting it at the scissors mark just proximal to the pilot tube and reconnecting the 15 mm connector.

The RAE (Ring, Adair and Elwyn) tube has a preformed shape to fit the mouth or nose without kinking. It has a bend located just as the tube emerges, so the connections to the breathing system are at the level of the chin or forehead and do not interfere with surgical access. RAE tubes can be either north or south-facing, cuffed or uncuffed.



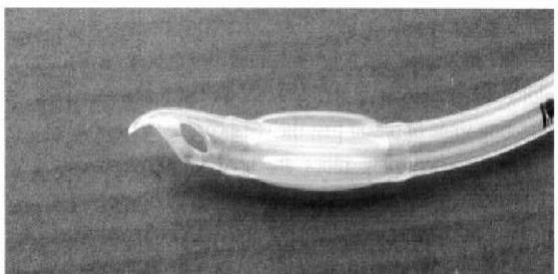
Due to its preformed shape, there is a higher risk of bronchial intubation than with ordinary tracheal tubes. The cuffed RAE tracheal tube has one Murphy eye whereas the uncuffed version has two eyes. Since the uncuffed version is mainly used in paediatric practice, two Murphy eyes help to ensure adequate ventilation should the tube prove too long. It can be temporarily straightened to insert suction catheter. *Laser resistant tracheal tube*

This tube is used in anaesthesia for laser surgery on the larynx or trachea. It is designed to withstand the effect of carbon dioxide and KTP laser beams, avoiding the risk of fire or damage to the tracheal tube. It has a flexible stainless steel body. Reflected beams from the tube are defocused to reduce the accidental laser strike to healthy tissues.

Some designs have two cuffs. This ensures a tracheal seal should the upper cuff be damaged by laser. An airfilled cuff, hit by the laser beam, may ignite and so it is recommended that the cuffs are filled with saline instead of air.

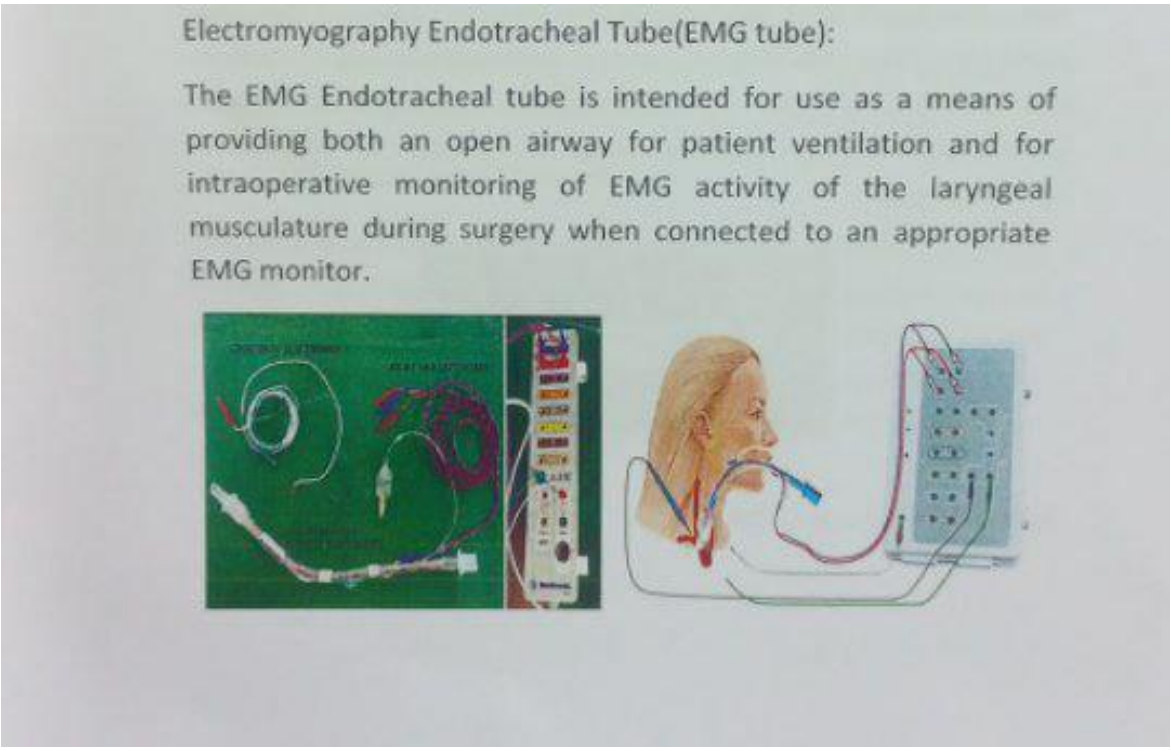
The parker tube:

The parker tube has a curved bevel on the inner curvature of the tube. The bevel therefore lies on the anterior aspect of the tube during insertion. The manufacturer claims that it is less likely than the conventional tube to cause trauma to the larynx or trachea, particularly during insertion over a bougie or fibreoptic laryngoscope



Microlaryngeal 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 cuff. Its length is sufficient to allow nasal intubation.



Tracheostomy tubes:

These are curved plastic tubes usually inserted through the second, third and fourth tracheal cartilage rings.

Components

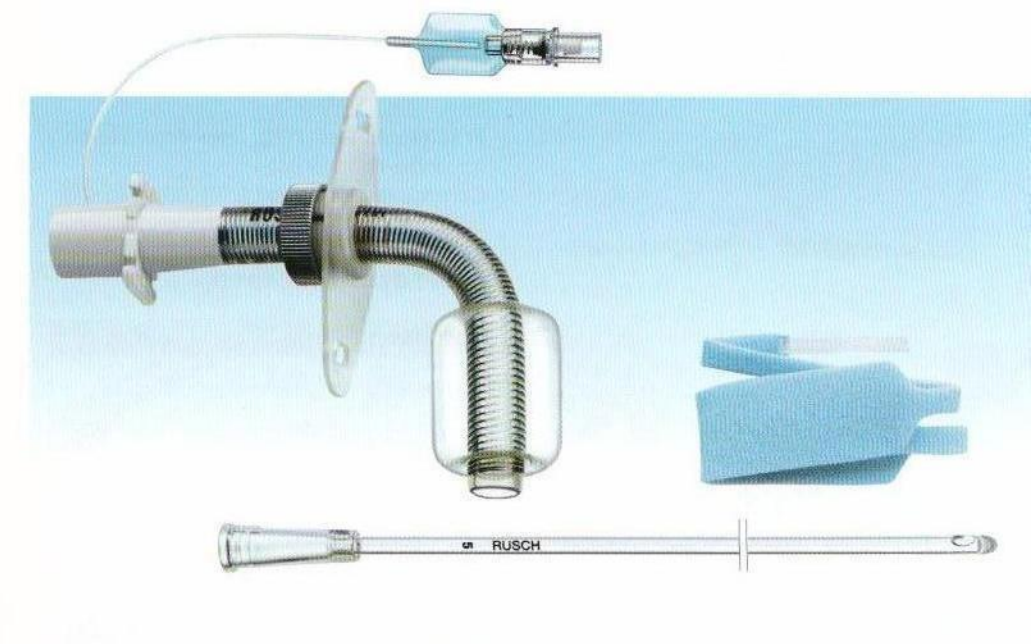
1. An introducer used for insertion.
2. Wings attached to the proximal part of the tube to fix it in place with a ribbon or suture.
3. They can be cuffed or uncuffed.
4. The proximal end is a standard 15 mm connector.
5. The tip is usually cut square, rather than bevelled. This is to decrease the risk of obstruction by lying against the tracheal wall.

There are different sizes of the tracheostomy tube to fit neonates to adults.

Tracheostomy tubes are used for:

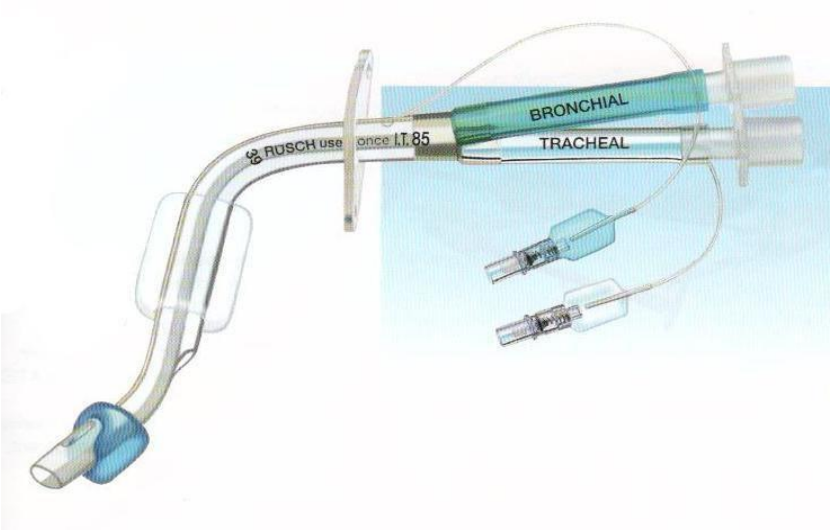
1. Long term intermittent positive pressure ventilation.
2. Upper airway obstruction that cannot be bypassed with an oral/ nasal tracheal tube.

3. Maintenance of an airway and to protect the lungs in patients with impaired pharyngeal or laryngeal reflexes and after major head and neck surgery (e.g. laryngectomy).
4. Long term control of excessive bronchial secretions especially in patients with a reduced level of consciousness.



Problems in practice and safety features:

1. Accidental bronchial intubation or displacement.
2. Erosion at the edge of the tracheostomy insertion site can cause bleeding.
3. Obstruction by thick secretions or foreign bodies.
4. Tracheal ulceration and dilatation followed by stenosis after extubation. Tracheal stenosis may occur at the level of the stoma, the cuff or the tip of the tube.



The fenestrated tracheostomy tube

1. The fenestration (window) in the greater curvature channels air to the vocal cords allowing the patient to speak.
2. After deflation of the cuff, the patient can breathe around the cuff and through the fenestration in addition to the stoma. This reduces airway resistance and assists in weaning from the tracheostomy in spontaneously breathing patients. *Metal tracheostomy tubes*

1. These tubes are used in patients needing longer term intubation.
2. They are made of a non-irritant and bactericidal silver.
3. They are uncuffed.
4. They have an inner tube which can be removed for cleaning at regular intervals.
5. Some designs have a one-way flap valve and a window at the angle of the tube to allow the patient to speak.

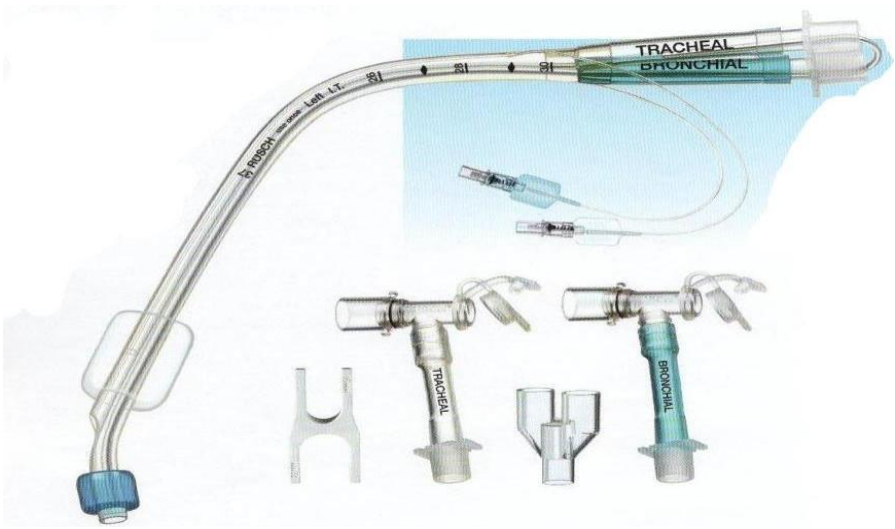
A track is formed after long term intubation and the tracheostomy tube can be removed. In order to protect the patency of the track, a tracheostomy button is inserted into the stoma. It also acts as a route for tracheal suction. Tracheostomy buttons are made of straight rigid plastic.

Laryngectomy tube

This is a cuffed tube inserted through a tracheostome to facilitate intermittent positive pressure ventilation during surgery. It has the advantage of offering better surgical access by allowing the breathing system to be connected well away from the surgical filed.

Double lumen endobronchial tubes

During thoracic surgery there is a need for one lung to be deflated. This offers the surgeon easier and better access within the designated hemithorax. In order to achieve this, double lumen tubes are used which allow the anaesthetist to selectively deflate one lung whilst maintaining standard ventilation of the other.



Components

1. The Mallinckrodt Bronchocath double lumen tube has two separate colour-coded lumens, each with its own bevel.3one lumen ends in the trachea and the other lumen ends in either the left or right main bronchus.
2. Each lumen has its own cuff (tracheal and bronchial cuffs) and colour-coded pilot balloons. Both lumens and pilot balloons are labelled.
3. There are two curves to the tube: the standard anterior curve to fit tracheal airway and the second curve, either to the right or left, to fit into the right or left bronchus respectively.
4. The proximal end of these tubes is connected to a Y-shaped to the breathing system.

Mechanism of action

1. Due to the differing anatomy of the main bronchi and their branches, both right and left versions of any particular double lumen tube must exist.
2. Once correctly positioned, the anaesthetist can selectively ventilate one lung. So, for operations requiring that the right lung is deflated, a left-sided double lumen tube would be used that enabled selective ventilation of the left lung alone and vice versa.
3. It is desirable, when possible, to insert a left double lumen tube instead of a right one. This reduces the risk of upper lobe bronchus obstruction by the bronchial cuff in the rightsided version.
4. The right-sided version has an eye in the bronchial cuff to facilitate ventilation of the right upper lobe. The distance between the right upper lobe bronchus and the carina in an adult is only2.5 cm, so there is a real risk of occluding it with the bronchial cuff. There is no eye in the left-sided version

because the distance between the carina and the left upper lobe bronchus is about 5 cm, which is adequate to place the cuff.

5. The tubes come in different sizes to fit adult patients but not in paediatric sizes.

Tube positioning

1. The position of the tube should be checked by auscultation immediately after intubation and after positioning the patient for the operation.
2. The tracheal cuff is inflated first until no leak is heard. At this point, both lungs can be ventilated. Next, the bronchial limb of the Y-catheter mount is clamped and disconnected from the bronchial cuff is inflated with only a few ml of air until no leak is heard from the bronchial tube.

The commonly used double lumen bronchial tubes are:

1. Robertshaw (rubber) tubes.
2. Bronchocath (plastic and disposable) tubes. These tubes require an introducer for insertion. A recent version of the Bronchocath has the facility of applying CPAP to the deflated lung to improve arterial oxygenation.
3. Carlens (left-sided version) and the White (right-sided version) tubes that use a carinal hook to aid final positioning of the tube. The hook can cause trauma to the larynx or carina. Because of the relatively small lumens (6 and 8mm), the Carlens tube causes an increase in airway resistance and difficulty in suctioning thick secretion.

Oropharyngeal airway

This anatomically shaped airway is inserted through the mouth into the oropharynx above the tongue to maintain the patency of the upper airway.

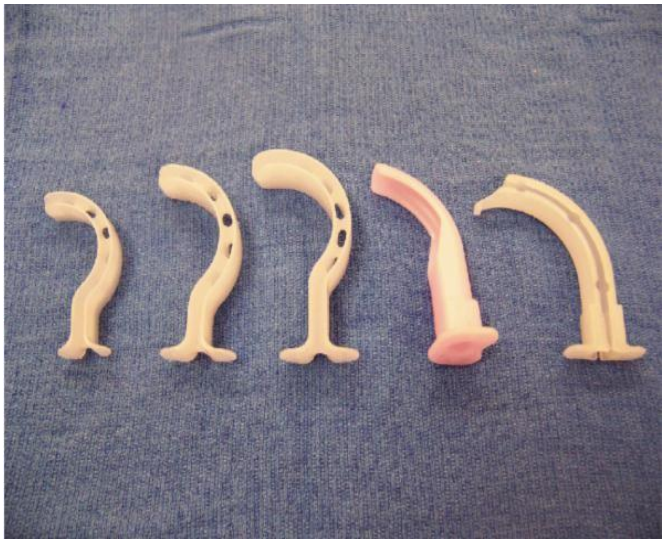
Components:

1. The curved body of the oropharyngeal airway contains he air channel. It is flattened anteroposteriorly and curved laterally.

2. There is a flange at the oral end to prevent the oropharyngeal airway from falling back into the mouth.
3. The bite portion is straight and fits between the teeth. It is made of hard plastic to prevent occlusion of the air channel should the patient bite the oropharyngeal airway.

Mechanism of action:

1. The patient's airway is kept patent by preventing the tongue and epiglottis from falling backwards.



2. Oropharyngeal airways are designed in different sizes to fit the majority of patients from neonates to adults.
3. The air channel should be as large as possible in order to pass suction catheters.

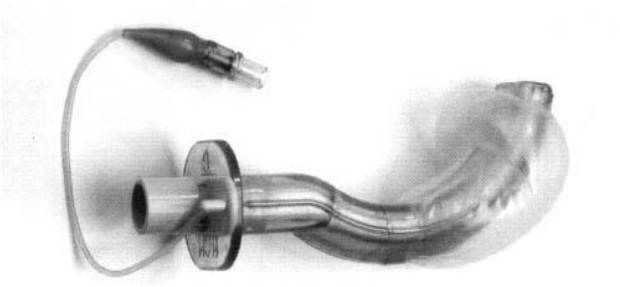
Problems in practice and safety features:

1. Trauma to the different tissues during insertion.
2. Trauma to the teeth , crowns/ caps if the patient bites on it.

3. If inserted in a patient whose pharyngeal reflexes are not depressed enough, the gag reflex and vomiting can occur.

The cuffed oropharyngeal airway (COPA)

The cuffed oropharyngeal airway (COPA) is essentially a Guedel airway with an extended pharyngeal section in which an inflatable cuff is embedded inflation of the cuff is designed to produce an airtight seal in the oropharynx and lift the tongue. It may be attached to the anaesthetic breathing system. It is designed to avoid tracheal intubation and is easier to place than the LMA. The advantages and disadvantages of this device are similar to those of the LMA, although it possibly does not form a sealed airway as well as the LMA. Four sizes are available (8,9,10 and 11) each colour-coded and representing the length of the COPA in centimeters.



Metallic oropharyngel airway:

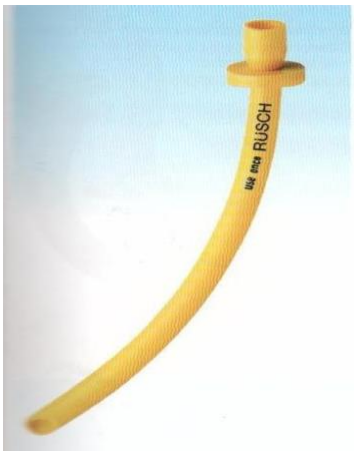
The shape of this type of the oropharyngeal airway is like the classic oropharyngeal airway bout it is made of metal and it has three side opens in the distal end like (Murphy eye) to avoid occlusion and it is used for many time by autoclaving it.

Berman and Williams airways:

To facilitate blind orotracheal intubation

Nasopharyngeal airway

This airway is inserted through the nose into the nasopharynx, bypassing the mouth and the oropharynx. The distal end is just above the epiglottis and below the base of the tongue.



Components:

1. The rounded curved body of the nasopharyngeal airway.
2. The bevel is left-facing.
3. The proximal end has a flange. A “safety pin” is provided to prevent the airway from migrating into the nose.

Mechanism of action:

1. It is an alternative to the oropharyngeal airway when the mouth cannot be opened or an oral airway does not relieve the obstruction.
2. Nasotracheal suction can be performed using a catheter passed through the nasal airway.
3. It is better tolerated by the semiawake patient then the oral airway.
4. A lubricant is used to help in its insertion.

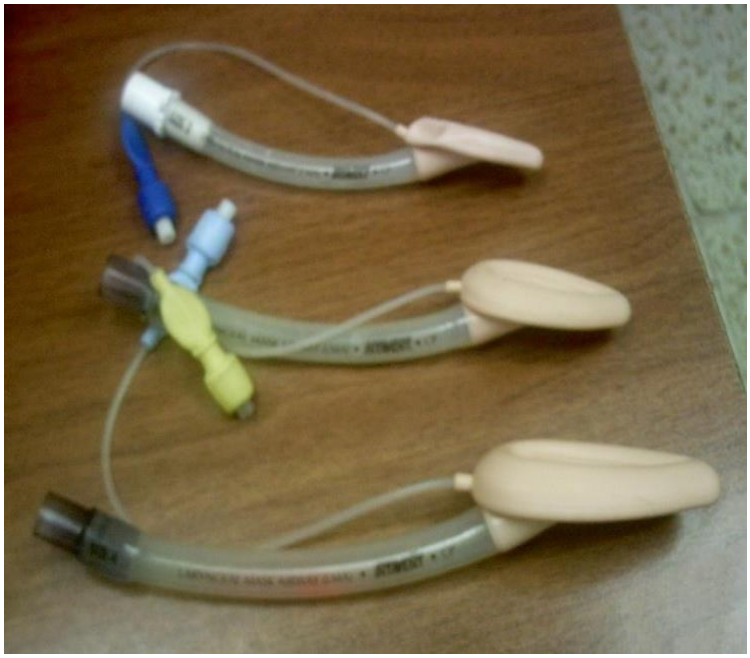
Problems in practice and safety features

1. Its use is not recommended when the patient has a bleeding disorder, is on anticoagulants, has nasal deformities or sepsis.

2. Excess force should not be used during insertion as a false passage may be created.

Laryngeal mask

This very useful device is frequently used as an alternative to either the face mask or tracheal tube during anaesthesia.



The laryngeal mask airway (LMA):

This device consists of a shortened conventional silicone tube with an elliptical cuff, inflated through a pilot tube, attached to the distal end. The cuff, which resembles a miniature face mask, has been designed to form a relatively airtight seal around the posterior perimeter of the larynx. A variety of sizes of cuff are available, ranging from size 1 which is used in the neonate to size 5 which is used in large adults. The mask is inserted and the cuff inflated until no air leak is detected. It is important to ensure that the maximum inflation volume is not exceeded. The device is very effective in maintaining a patent airway in the spontaneously breathing

patient. Positive pressure ventilation may be applied if necessary. The mask is not suitable for patients who are at risk from regurgitation of gastric contents (emergency surgery, hiatus hernia or history of reflux and obesity) and should be used with caution if pharyngeal soiling is anticipated.

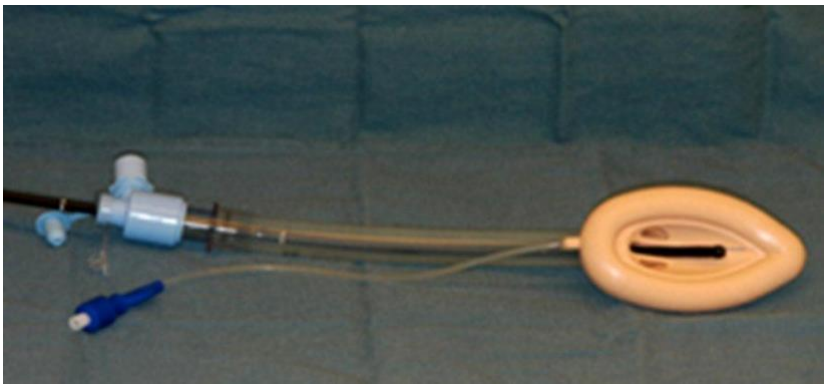
Components

1. A transparent tube of wide internal diameter, the proximal end is a standard 15mm connection.
2. An elliptical cuff at the distal end. The cuff resembles a small face mask and is inflated via a pilot balloon with a selfsealing valve. A non-metallic self-sealing valve is available for use during MRI scans.
3. There are slits at the junction between the tube and the cuff. These prevent the epiglottis from obstructing the laryngeal mask.

Mechanism of action:

1. The cuff is deflated and lubricated before use. It is inserted through the mouth. The latex cuff lies over the larynx.
2. Once the cuff is in position, it is inflated.

3. The laryngeal masks have wide internal diameters in order to reduce the flow resistance to a minimum (e.g. the internal diameters of sizes 2,3,4 and5 are7,10,10 and 11.5 mm respectively). This makes them suitable for long procedures using a spontaneous ventilation technique.
4. It also has a role as aid in difficult intubation. Once in position, it can be used to introduce a bougie or a narrow lumen tracheal tube into the trachea.



The reinforced version of the laryngeal mask is used for head and neck surgery.

1. The tubes, although flexible, are kink and crush resistant due to a stainless steel wire spiral in their walls. The tubes can be moved during surgery without loss of the cuff's seal against the larynx. The breathing system can easily be connected at any angle from the mouth.
2. A throat pack can be used with the reinforced version.
3. The reinforced laryngeal masks have smaller internal diameters and longer lengths than the standard versions, causing an increase in flow resistance. This makes their use with spontaneous ventilation for prolonged periods less suitable.

The flexible LMA differs from the standard LMA in that it has flexible, wire reinforced tube. It is available in size 2,2.5, 3, 4and 5. The size of the cuff is similar to that of the standard LMA but tube is longer and narrower and therefore offers more resistance to breathing. Because of the wire in the tube, it is unsuitable for use in the MRI unit. The classic LMA is re-usable up to 40 times. However, disposable LMAs are now available.

Problems in practice and safety features:

1. The laryngeal mask does not protect against the aspiration of gastric contents.
2. Despite the presence of the slits, about 10% of patients develop airway obstruction due to downfolding of the epiglottis.
3. The manufacturers recommend using the laryngeal masks for a maximum of 40 times. Latex rubber is likely to perish after autoclaving. A record card that accompanies the laryngeal mask registers the number of autoclaving episodes.
4. Unlike the tracheal tube, rotation of the laryngeal mask may result in complete airway obstruction. In order to assess the laryngeal mask's orientation when inserted, a black line is present on the tube. This should face the upper lip of the patient when the laryngeal mask is in position.

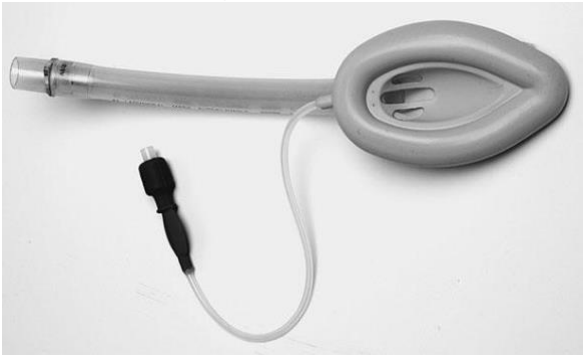
Types of LMA

LMA Devices: Description

LMA Classic and Unique

The original LMA was introduced in 1988 and has now been used well over 100 million times. It remains in widespread use in its reusable format, the LMA Classic, and a more recently introduced disposable version, the LMA

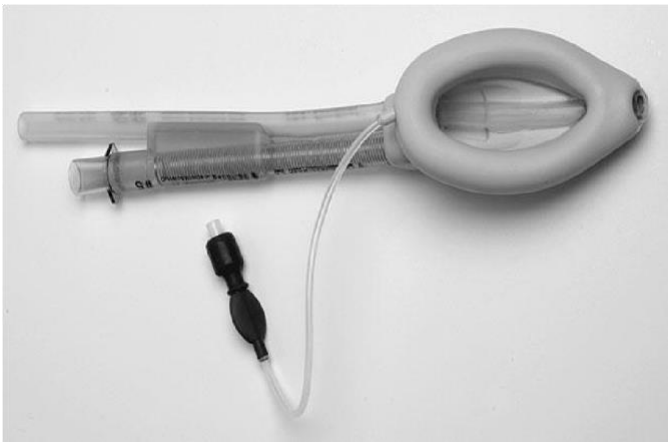
Unique. Both versions are latex-free and consist of a large-bore airway tube with proximal standard 15-mm connector, and a bowl-shaped distal cuff which is inflated via a valve on an inflation line. With the opening of its lumen facing the laryngeal inlet, the mask conforms to the shape of the pharynx. Both the LMA Classic and Unique are available in a full range of sizes, from neonatal to large adult.



The LMA Classic.

LMA ProSeal

The LMA ProSeal was introduced in 2000. This version of the LMA includes a drain tube, which originates from an orifice in the distal tip of the mask cuff and travels proximally alongside the airway lumen. The drain tube is designed to accept a catheter which can be used for suctioning esophageal contents. The cuff of the LMA ProSeal has also undergone modifications, including the addition of a posterior component (only in the adult sizes) to better conform to the shape of the pharynx. These cuff modifications allow for an airway seal pressure up to 10 cm H_2O higher than that of the LMA Classic. A built-in proximal bite block has also been added. With its improved seal and provision for gastric tube placement, the ProSeal offers more protection of the airway against aspiration of gastric contents, and allows ventilation at higher airway pressures, perhaps making it a better choice than the LMA Classic or Unique for use in emergencies.



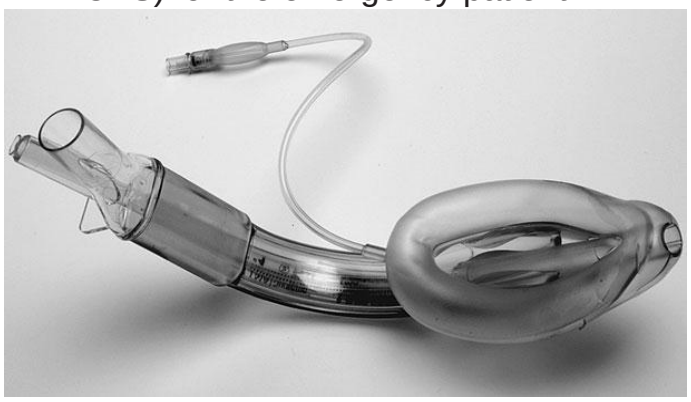
The LMA ProSeal.

The LMA pro-seal

The LMA pro-seal is another advanced form of the classic LMA and it is designed to have additional benefits over the ordinary LMA. It has a double lumen. The drain tube passes lateral to the airway tube and traverses the floor of the mask to open in the mask tip opposite the upper oesophageal sphincter. It may permit drainage of gastric contents or allow passage of an orogastric tube. The drainage tube is also intended to prevent gastric insufflations. The airway tube is wire reinforced to prevent collapse and it ends with a standard 15-mm connector. The cuff arrangement allows a higher seal than the LMA for a given intracuff pressure, which permits more effective ventilation of the lungs. It has a built-in bite-block to reduce the danger of airway obstruction from the patient biting on the LMA. The pro-seal LMA is re-usable up to 40 times and all its components are latex free. It can be mounted on an introducer which facilitates the insertion of the LMA pro-seal into the patient's mouth.

LMA Supreme

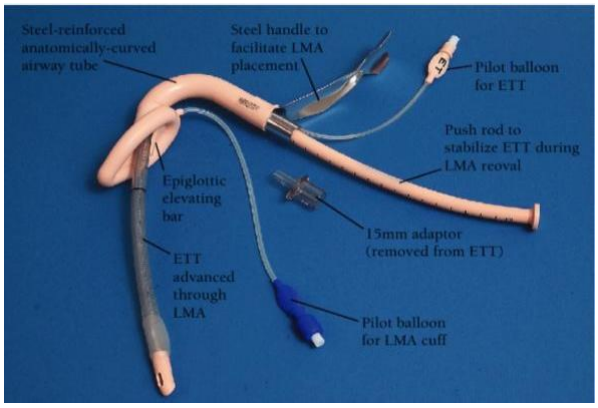
The single-use LMA Supreme is a recent addition to the LMA family. It features an L-shaped airway tube, a modified cuff to enable ventilation at higher airway pressures, a second lumen for esophageal drainage, and a proximal bite block. At the time of writing, no published literature was available on this device. However, designed for easy insertion (L-shaped tube), airway protection (presence of esophageal drainage lumen), and ventilation at higher airway pressures (cuff design) this device has the potential to become a good choice of single-use EGD (EXTRAGLOTTIC DEVICES) for the emergency patient.



The LMA Supreme.

LMA Fastrach and CTrach

The L-shaped LMA Fastrach and its similarly shaped video-based sibling, the LMA CTrach, were designed to enable blind or video-aidedintubation, respectively. However, both are also effective as rescue oxygenation and ventilation devices, with a high first attempt insertion and successful ventilation rate. The LMA Fastrach has been shown to have an oropharyngeal leak pressure 5–10 cm H_2O higher than the LMA Classic. As they were designed to also facilitate intubation, these devices have been discussed in more detail with intubation instruments.



The LMA Fastrach

The intubating LMA

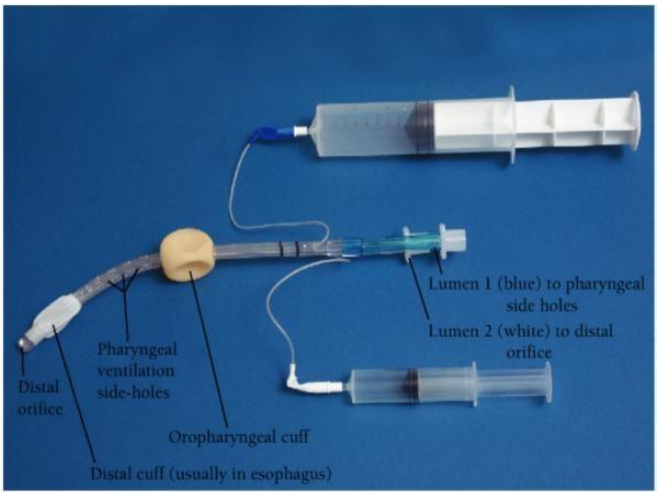
The intubating LMA (ILMA) is an advanced form of the standard LMA. It has a shorter tube and a metal handle. The handle permits single- handed insertion without moving the head and neck and without placing fingers in the mouth. It may be passed through an interdental gap as narrow as 20mm. The mask floor has an elevating bar which replaces the two bars in the standard LMA. The caudal end of the bar is not fixed to the mask floor and this allows a tracheal tube to be passed in order to intubate the trachea. The ILMA is available in sizes 3,4and 5. The recommended cuff volumes are similar to the corresponding sizes of the standard LMA. The rigid curved airway has a standard 15mm connector at the proximal end. The tube is wide enough to allow passage of a cuffed 8-mm tracheal tube. The ILMA is a reusable device which may be cleaned and sterilized up to 40 times.

The C-Trach device Supraglottic devices:

The combitube

The combitube is a double-lumen airway which is designed to be inserted blindly in difficult and emergency situations. When inserted, it allows establishment of an effective airway whether it is placed into the oesophagus or the trachea. It combines the

function of an oesophageal obturator and conventional tracheal tube and it protects the airway against aspiration of gastric contents. The tube has two cuffs, a proximal larger pharyngeal cuff (85-100 ml) and the smaller distal cuff (10-15ml). The distal cuff may be placed in either the oesophagus or the trachea. Between 94 % and 98% of blind insertions usually result in oesophageal placement. In this situation, the breathing system is attached to the longer blue connecting tube and the combitube acts as a pharyngeal airway. If the tube enters the trachea, ventilation of the lungs should be carried out using the shorter connecting tube and it acts as an ordinary tracheal tube.



The esophageal tracheal combitube (ETC). Note two tubes with two cuffs, two pilot balloons and two lumens

The airway management device (AMD):

The AMD is a another supraglottic device which is inserted blindly. It has a single lumen, a double cuff and two pilot balloons. An oesophageal aperture becomes patent when the distal cuff is deflated. Its role in airway management is yet to be fully established as it does not offer many further benefits over other devices already available.

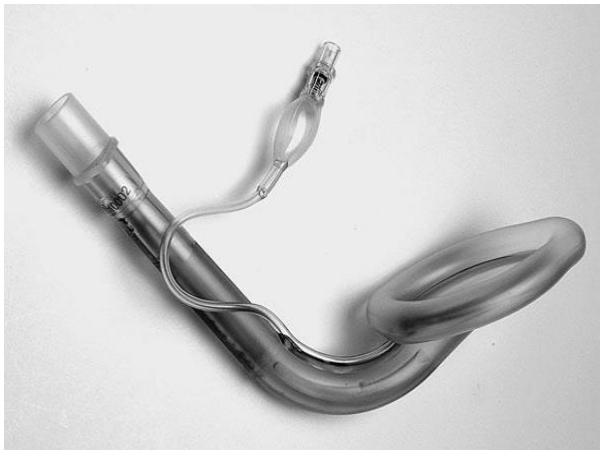
NEWER EXTRAGLOTTIC DEVICES

In recent years, numerous new extraglottic devices have been introduced. Many, but not all, are single-use items. Some have more accompanying narrative in the literature than others, however early experience looks promising for many in terms of ease of insertion and effectiveness. As many hospitals are trending toward the use of disposable equipment, the clinician should be prepared to be presented with an unfamiliar device from time to time! The disposable **Portex Soft-Seal laryngeal mask** is similar in shape to the LMA Unique, but with a blunter distal cuff, a deeper bowl, wider airway tube, and no mask aperture bars.

The Portex Soft Seal laryngeal

Compared to the LMA Unique or Classic, the Soft-Seal has similar reported insertion success rates, oropharyngeal leak pressure, and ease of ventilation. The Soft-Seal is availablein adult and pediatric sizes. Ambu also markets an extraglottic airway in both reusable (the **Aura40**) and disposable (the **AuraOnce**) formats. It differs from the LMA Classic/Unique and Portex Soft-Seal in having a premolded L-shaped airway tube proximal to the distal cuff. The cuff is manufactured from a soft material and has a reinforced tip

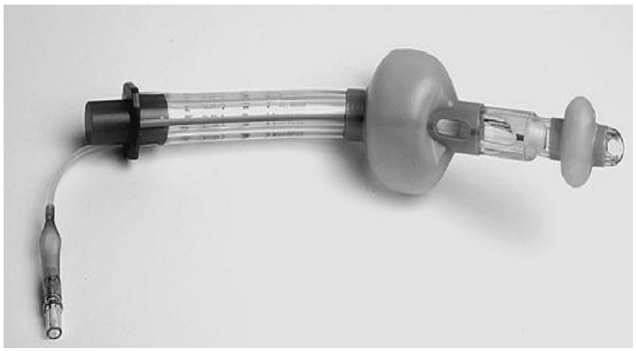
to resist bending during insertion. For insertion, the cuff is deflated, and, holding the device proximally, the tip is inserted behind the upper teeth. Following the hard and soft palate, it is then rotated down into the pharynx. The Aura extraglottic airways are available in adult and pediatric sizes. Early data suggests a good first attempt success rate, and an oropharyngeal leak pressure of 18–25 cm H_2O.

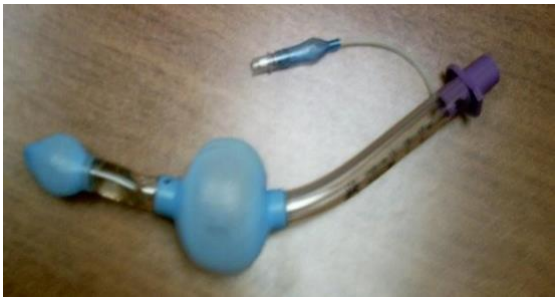


The Ambu AuraOnce

The King **Laryngeal Tube**

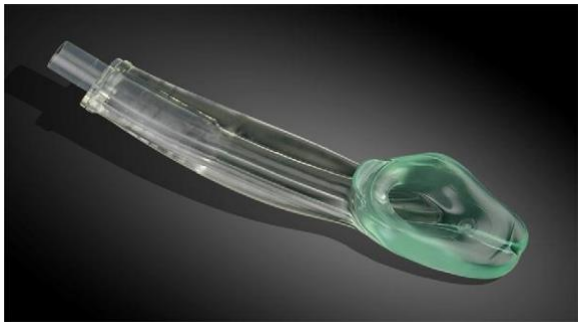
Consists of an airway tube with two cuffs: one distal, to seal the esophagus, and one proximal midway up the tube, to seal the oro- and nasopharynx. Between the two cuffs are multiple ventilation apertures. As with the Combitube, ventilation emerges from these apertures, between the proximal pharyngeal and distal esophageal cuffs. Unlike the Combitube, inflation of both cuffs occurs through a single pilot line. The LT is available in adult and pediatric sizes, in reusable (LT) and disposable (LT-D) versions. A disposable version with a separate gastric drainage channel (LTS-D) is also available. Insertion is begun with the head and neck in the ‘sniffing’ position, with concomitant jaw lift. The lubricated LT is inserted through the mouth and advanced behind the base of the tongue. It is advanced until (a) resistance is encountered, or (b) the connector base is aligned with teeth or gums. The cuffs are then inflated (Size 3–45 to 60 mL; size 4–60 to 80 mL; size 5–70 to 90 mL). A self-inflating manual resuscitator is attached, and if necessary, the LT can be slowly withdrawn until easy ventilation is achieved. Studies of ease and success of insertion have been favorable, with a quoted success rate of 97%–100%. Comparison studies with the LMA Classic have generally shown equivalent efficacy.





Other EGDs continue to be introduced, for example, the cuffed **Cobra Perilaryngeal Airway** and the cuffless **SLIPA** and **I-gel** airways. Indeed, it is probably safe to say that each passing year will see additional devices come to market. While some may have a price advantage over more traditional extraglottic devices, it must be said that the burden of proof lies on the new devices to have their safety and efficacy demonstrated before their routine use can be espoused over EGDs with a long history of safe use. In addition, using an EGD that is in common use in an institution's operating rooms increases the opportunity for obtaining experience in the nonemergency setting.

Cobra Peri-Laryngeal Airway



I-gel airway

Slipa airway

chou- airway