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الموضوعات

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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 as well as through the stoma. This reduces airway resistance and assists in weaning from Montandon laryngectomy tube.
3. Some tubes have a fenestrated inner cannula.

LARYNGECTOMY (MONTANDON) TUBE

This is a cuffed tube inserted through a tracheostomy to facilitate intermittent positive pressure ventilation during neck surgery.

It has the advantage of offering better surgical access by allowing the breathing system to be connected well away from the surgical field.

Tracheostomy button

Once a tracheostomy is removed after long-term use, this device is inserted into the stoma to maintain patency of the tract and also acts as a route for tracheal suction.

Percutaneous Tracheostomy Tubes

These tubes are inserted between the first and second or second and third tracheal rings, usually at the bedside in the intensive care unit.

1. If the patient is intubated, the tracheal tube is withdrawn until the tip is just below the vocal cords. Then the cuff is inflated and rested on the vocal cords.
2. Through an introducing needle, a Seldinger guide wire is inserted into the trachea.
   A fibreoptic bronchoscope should be used throughout the procedure.
   It helps to ensure the initial puncture of the trachea is in the midline and free of the tracheal tube.
   It can also ensure that the posterior tracheal wall is not damaged during the procedure.
   Finally, it can assess the position of the tracheostomy tube relative to the carina.
3. A pair of specially designed Griggs forceps is inserted over the guide wire.
   These forceps are used to dilate the trachea.
   A tracheostomy tube is threaded over the guide wire and advanced into the trachea.
   The guide wire is then removed.
4. A series of curved dilators can be used instead of the dilating forceps.
   The diameter of the stoma is serially increased until the desired diameter is achieved.
   A single curved dilator of a graduated diameter can be used instead.
   A tracheostomy tube can then be inserted.
5. An adjustable flange percutaneous tracheostomy is available.
   The flange can be adjusted to suit the patient's anatomy, e.g. in the obese patient.
6. The procedure can be performed in the intensive care unit with a lower incidence of complications surgical method (infection rate, subglottic stenosis and bleeding problems).
7. Percutaneous tracheostomy can be performed faster using the dilating forceps technique compared to the dilator technique.

8. There is an increased risk of surgical emphysema due to air leaks from the trachea to the surrounding tissues.
   Loss of the airway, bleeding and incorrect placement of the needle are potential difficulties during the procedure.
9. Relative contraindications include enlarged thyroid gland, non-palpable cricoid cartilage, paediatric application, previous neck surgery and positive end expiratory pressure (PEEP) of more than 15 cm H_2O.
10. Reinsertion of a percutaneously fashioned tube can be more difficult than the surgical one as the stoma may close immediately.
    A track is formed after long-term intubation and the tracheostomy tube can be removed. In order to protect the patency of the tract, 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.

Minitracheostomy tube

This tube is inserted percutaneously into the trachea through the avascular cricothyroid membrane.

Components

1. A siliconized PVC tube 10 cm in length with an internal diameter of 4 mm.
   Some designs have lengths ranging from 3.5 to 7.5 cm with internal diameters from 2 to 6 mm.
2. The proximal end of the tube has a standard 15 mm connector that allows attachment to breathing systems.
   The proximal end also has wings used to secure the tube with the ribbon supplied.
3. A 2 cm, 16 G needle is used to puncture the cricothyroid cartilage.
   A 50 cm guide wire is used to help in the tracheal cannulation.
   A 10 mL syringe is used to aspirate air to confirm the correct placement of the needle.
4. A 7 cm curved dilator and a curved introducer are used to facilitate the insertion of the cricothyrotomy tube in some designs.

Mechanism of action

1. The Seldinger technique is used to insert the tube.
2. It is an effective method to clear tracheobronchial secretions in patients with an inefficient cough
3. In an emergency, it can be used in patients with upper airway obstruction that cannot be bypassed with a tracheal tube

Problems in practice and safety features

1. Pneumothorax.
2. Perforation of the oesophagus.
3. Severe haemorrhage.
4. Ossification of the cricothyroid membrane.
5. Incorrect placement.

Cricothyrotomy tube

This tube is used to maintain the airway in emergency situations such as on the battlefield.

It is inserted into the trachea through the cricothyroid cartilage.

Components

- A scalpel and syringe
- A needle with a veress design and a dilator.
  The needle has a 'red flag' indicator.
  This helps in locating the tissues.
  3.6 mm cuffed tube.

Mechanism of action

1. After a 2 cm horizontal skin incision has been made, the needle is inserted perpendicular to the skin.
2. As the needle enters the trachea, the red indicator disappears.
   The needle is advanced carefully until the red reappears, indicating contact with the posterior wall of the trachea.
3. As the cricothyrotomy tube is advanced into the trachea, the needle and the dilator are removed.

Problems in practice and safety features

The cricothyrotomy tube has complications similar to the minitracheostomy tube cuff arrangement.

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 while 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.
   One 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 into the oropharyngeal laryngeal 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 catheter mount attached to the breathing system.

Mechanism of action

1. Because of 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 the tubes are 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 right-sided 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 only 2.5 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.
   It is also recommended to use a fibreoptic bronchoscope to confirm correct positioning of the double lumen tube.
2. The tracheal cuff is inflated first until no leak is heard. At this point, both lungs can be ventilated.
   Next, the tracheal limb of the Y-catheter mount is clamped and disconnected from the tracheal lumen tube.
   Then, the bronchial cuff is inflated with only a few millilitres of air until no leak is heard from the tracheal tube.
   At this stage, only the lung ventilated via the bronchial lumen should be ventilated.
   The ability to selectively ventilate the other lung should also be checked by clamping the bronchial limb of the Y-catheter mount and disconnecting it from the bronchial lumen having already reconnected the tracheal lumen.
   At this stage, only the lung ventilated via the tracheal lumen should be ventilated.

The commonly used double lumen bronchial tubes are:

- Robertshaw (rubber) tubes
- Single-use plastic tubes. These tubes require an introducer for insertion.
  A more recent version of the single use has the facility of applying continuous positive airway pressure (CPAP) to the deflated lung to improve arterial oxygenation.
- Carlens (left-sided version) and 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 8 mm), the Carlens tube causes an increase in airway resistance and difficulty in suctioning thick secretions.