

# How to intubate

## Introduction

Modern endotracheal anaesthesia and intubation was developed by Magill and Rowbottom after the First World War. Since then tracheal intubation has become an essential part of airway management in elective and emergency acute medicine.

## Indications for intubation

### Non-anaesthetic

- During cardiopulmonary resuscitation to secure and protect the airway and to maintain oxygenation
- When intermittent positive pressure ventilation is required, e.g. respiratory failure
- To secure and protect the airway, e.g. in airway obstruction, unconscious patients, and in patients with impaired protective reflexes when the endotracheal tube minimizes the risk of aspirating blood, mucus and gastric acid
- To allow removal of sputum and secretions (tracheobronchial toilet).

### Anaesthetic

- To secure an airway when access to the patient is restricted, e.g. head and neck surgery, neurosurgery and the prone position
- To protect against tracheal soiling by blood, mucus and gastric contents during dental, ear, nose and throat (ENT), and emergency surgery
- When muscle relaxation is required, e.g. abdominal surgery
- When intermittent positive pressure ventilation is required in patients with respiratory disease, or during thoracic, cardiac surgery or neurosurgery, or to facilitate airway protection and ventilation during prolonged surgery.

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## Equipment required

When intubating the trachea, there are four essentials to ensure a safe intubation. They can be remembered from the mnemonic SALT.

### Suction device

- Suction is needed to remove anything local in the pharynx that might soil the airway or obscure the cords.

### Airway

- The oral airway, e.g. the Guedel airway, lifts the tongue away from the posterior pharynx making it easier to ventilate a patient by mask. A source of oxygen and a delivery system, e.g. Ambu-bag and mask, must be available.

### Laryngoscopes

- The laryngoscope consists of a blade incorporating a fibreoptic light source and a handle that contains the power source for the light
- The Macintosh curved blade is the most commonly used blade in the UK and is to be found on most intubation and resuscitation trolleys. The Magill blade is the most commonly used straight blade in the UK. Blades are available in sizes 1–4.

### Endotracheal tubes

- The commonest endotracheal tube is a curved plastic tube which has an inflatable cuff to provide a seal between the tube and the wall of the trachea
- The internal diameter is indicated on the side of the endotracheal tube. Suitable sizes are 7.0 mm for most women and 8.0–9.0 mm for most men
- The length of tube at the lips of the intubated patient is important because it is easy for the tube to slip into a bronchus, especially the right one, thus ventilating only one lung. For most women the 19–21 cm mark should be at the lips, and for most men the 21–23 cm mark
- Uncuffed tubes are smaller and are usually used in children under 12 years of age. This is because the child's airway is narrowest subglottically and prolonged cuff inflation has caused necrosis of the

mucosal lining. After intubating a child's trachea there must always be an audible leak of air

- There are many other types of endotracheal tubes, including reinforced tubes, double lumen tubes, and the specialized tubes used in neurosurgical, thoracic and ENT procedures.

This equipment, as well as a syringe to inflate the cuff and other aids, are found on standard intubation trolleys (*Figure 1*). All emergency equipment and resuscitation drugs must be available and checked before attempting intubation.

## The technique of intubation

Position the patient with the neck flexed on the trunk at about 35° and the head extended on the neck at 15°: sniffing the morning air. This allows the straightest line of vision from the mouth to the vocal cords.

With the patient's lungs oxygenated and the patient either paralysed or, if breathing spontaneously, adequately anaesthetized, hold the mouth open with the right hand and holding the laryngoscope in your left hand, introduce it into the right-hand side of the mouth. Place the tip of the blade carefully along the upper right surface of the tongue, moving the blade into the midline and the tongue to the left keeping it in the groove of the blade until the epiglottis is visible.

If a curved Macintosh blade is used, the tip is placed into the valleculae between the epiglottis and the base of the tongue, after which the laryngoscope is lifted in the

**Figure 1.** The layout of a standard intubation trolley. Essential intubation equipment includes suction apparatus, oral and nasopharyngeal airways, laryngoscope, endotracheal tubes, mask and Ambu-bag with oxygen supply, 10 ml syringe to inflate cuff, stylet or bougie, stethoscope.



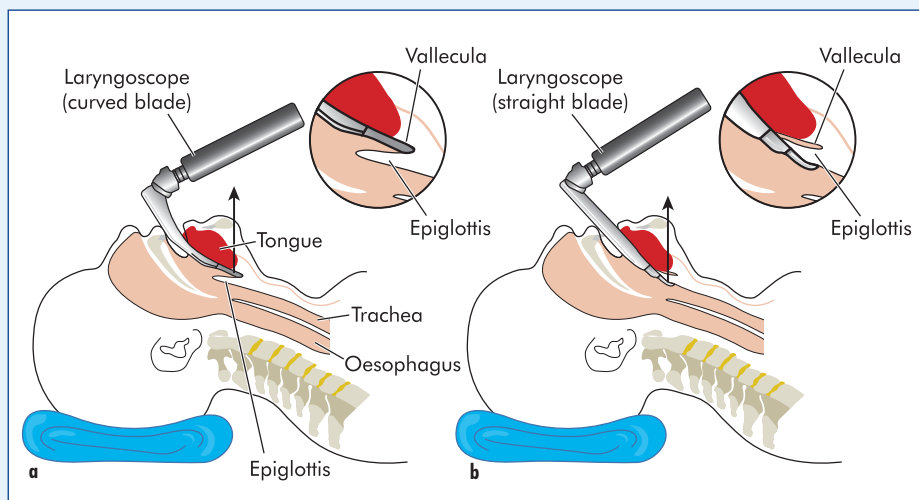


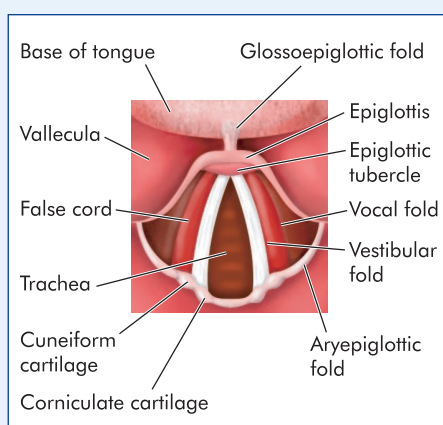
Figure 2. Use of (a) curved blade and (b) straight blade laryngoscope.

direction of the long axis of the handle, avoiding pivoting or pressure on the upper teeth (Figure 2). This flips the epiglottis upwards (anatomically anterior) and exposes the glottis below. An opening is seen with the two white vocal cords forming two sides of a triangle on each side (Figure 3).

If a straight Magill blade is used, the tip is slid over (anatomically posterior) to the epiglottis and then the blade lifted. The glottis then becomes visible beyond the tip of the blade (Figure 2).

You should then be able to insert the endotracheal tube under direct vision, holding it in your right hand, and approaching the cords from the right-hand side of the mouth to avoid obscuring the cords during intubation. The view of the glottis may be improved by pressing on the larynx from the front of the neck. If the view is incomplete or insertion is difficult, intubation aids such as a stylet or bougie may help.

Figure 3. View of the normal larynx during laryngoscopy.



Inflate the tube cuff slowly until there is no audible air leak.

Check expansion of the chest and auscultation of both lungs to exclude accidental intubation of the right main bronchus. Capnography confirms correct placement of the tube (although will not detect bronchial placement), but is not usually available outside the operating department.

Secure the endotracheal tube with a tie or adhesive tape, making sure that it is secure and cannot slide up and down the trachea.

### Management of a failed intubation

Early recognition that intubation failed (Table 1) is important. In obese patients it is easy to mistake oesophageal placement and abdominal movement for correct tracheal intubation. Try your best to maintain oxygenation and prevent aspiration of gastric contents.

Make no more than three attempts at direct laryngoscopy. If the patient is

becoming hypoxic, ventilate by mask before each attempt.

Be wary of airway trauma and swelling caused by traumatic and repeated attempts of intubation, which can turn a 'cannot intubate' urgency into a 'cannot intubate, cannot ventilate' emergency.

Call for help and while waiting:

- Oxygenate by face mask and Ambu-bag using 100% oxygen
- Consider using a laryngeal mask airway or performing a cricothyrotomy. **BJHM**

#### Further reading

Aitkenhead A, Smith G eds (1996) *Textbook of Anaesthesia*. 3rd edn. Churchill Livingstone, London  
 Ambrose C, Taylor M (2004) Tracheal intubation. *Anaesth Intens Care Med* 5(9): 286–8  
 Yentis S, Hirsch N, Smith G eds (2000) *Anaesthesia and Intensive Care A-Z*. 2nd edn. Butterworth Heinemann, Oxford

### Table 1. Complications of tracheal intubation

Immediate complications	Trauma to the teeth, lips, pharynx, larynx and eyes
	Hypertensive response associated with sympathetic activity and tachycardia
	Increase in intracranial pressure
	Arrhythmias, particularly if hypoxia and hypercapnia are present
	Laryngospasm and bronchospasm
Late complications	Aspiration of gastric contents
	Failed intubation
	Vocal cord ulceration
	Tracheal stenosis following prolonged intubation
	Nasal or tracheal ulceration

### KEY POINTS

- Tracheal intubation is an essential skill required during many elective anaesthetic and emergency medical situations.
- The clinician must be familiar with the essential intubation equipment before attempting intubation.
- Basic anatomical knowledge of the larynx is essential.
- Confirmation of the correct placement of the endotracheal tube is obtained by seeing the tube go through the vocal cords, from chest movement and auscultation, and by capnography.
- Early recognition of a failed intubation is important and management is directed towards maintaining oxygenation and preventing aspiration of gastric contents.
- Tracheal intubation has well-recognized complications.