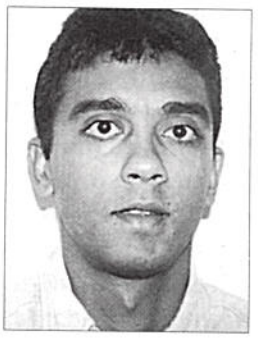
By Dr David McCoy BM, DA(UK)

Anaesthesia, intubation and extubation



David was trained as a medical doctor in England where he worked in obstetrics and anaesthesia. He completed his DA in 1991 and came to work in Hlabisa Hospital, KwaZulu in 1992. He completed a Master's degree (MPhil) in Maternal and Child Health from the University of Cape Town, and is currently employed as a research fellow at the Child Health Unit, University of Cape Town. Current research topics include health information systems, STDs, maternal health and health systems research.

On behalf of the Rural Health Task Group of the Academy of Family Practice/Primary Care.

This series is also being produced as a booklet for the use of doctors in Rural Hospitals and is obtainable from SA Family Practice.

This chapter discusses the issues surrounding tracheal intubation. All of the drugs described in this chapter will be explained further in subsequent chapters.

The series will have the following sections:

1. Introduction to anaesthetics and anaesthetic safety checklist
2. Anaesthesia, intubation and extubation
3. The pre-operative assessment
4. Anaesthetic drugs I
5. Anaesthetic drugs II
6. Spinal anaesthesia
7. Caesarean Sections
8. Paediatric anaesthesia
9. Complications during anaesthesia
10. Local and regional anaesthesia
11. Ventilation and breathing systems
12. Blood transfusion

INDICATIONS FOR INTUBATION

A. Maintaining and securing a clear airway

- In some patients it is difficult or impossible to maintain a clear airway under anaesthesia with only a face mask. Neonates, elderly edentulous patients and fat people are such cases. Some anaesthetists will intubate all children under one year.
- The position in which the patient is placed for operation may make intubation essential for control of the airway, eg the prone position.
- Surgery around the head and neck often requires intubation to allow the anaesthetist to retreat from the surgical field.
- In sick or severely traumatised patients, intubation will allow the anaesthetist to free his/her hands to do other things.

B. Intubating to facilitate Intermittent Positive Pressure Ventilation (IPPV)

- Remember that if the lungs are inflated using a face mask, gas will pass not only through the airways but also into the stomach. IPPV should therefore not be continued for more than a few minutes without intubation in the elective case, and never in the patient with a full stomach.

C. Intubating to protect the lower airway

- Any patient who lacks the protective cough or gag reflex is at risk of aspiration. This may be prevented by a cuffed endo-tracheal tube which is mandatory in all patients who may have a full stomach.

  The only patients who can be considered to have empty stomachs are elective patients who have had nil by mouth for six hours (four hours for fluids).

INTUBATING SAFELY

The standard method for intubation which you will use for most adult cases is to induce the patient with an intravenous agent, paralyse with suxamethonium and then intubate. (In elective paediatric cases you can often use a gas induction with Halothane as an alternative to an intravenous induction agent.)

Make intubation easier for yourself:

1. Pre-oxygenate all patients with

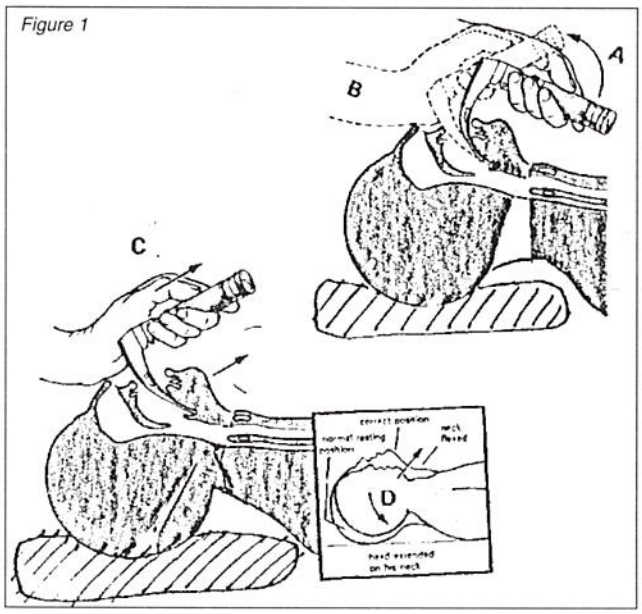


Figure 1: How to use a laryngoscope.

A: Insert the laryngoscope with your wrist straight, then extend your wrist.

B: Finally, lift the patient's jaw forwards.

C: The secret of success is to have the patient's head extended on his neck before you begin.

D: And to have his neck flexed forwards.

E: Arrange the pillow under his neck and shoulders so that you can achieve this. This has been likened to the position of 'sniffing the morning air'.

Kindly contributed by Nigel Pereira.

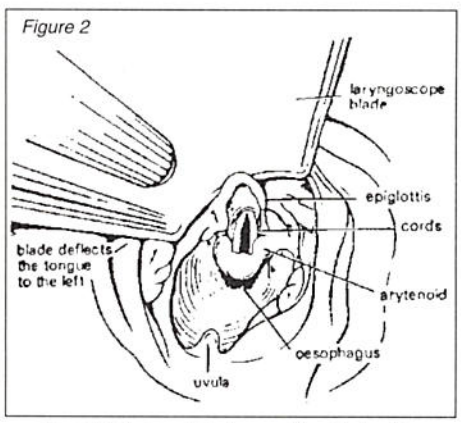


Figure 2: A view of the larynx. The blade of the laryngoscope is anterior to the patient's epiglottis. The blade has deflected the tongue to the left. Kindly contributed by John Farman.

100% oxygen for at least three minutes prior to induction. If things go wrong, this will give you more time to rescue the situation.

2. Make sure that all the equipment that you might need is working and at hand – especially suction and well lit laryngoscopes with a bright light.
3. If you have anticipated a difficult intubation have a stylette or bougie ready and at hand.
4. Place the patient in the optimum position – this is commonly referred to as the 'sniffing the morning air' position, ie extend at the occipito-cervical angle and flex at the cervico-thoracic angle. This is best achieved by laying the patient's head on a couple of pillows, or on a headrest.

RAPID SEQUENCE TRACHEAL INTUBATION (RSTI)

This is sometimes referred to as a 'crash induction'. However, a rapid sequence intubation should **not** be 'crashed' – intubate the patient quickly but not in a hurry.

This is the procedure for the intubation of any patient assumed to have a full stomach. It is especially important in patients requiring emergency abdominal surgery or any other patient who is at special risk of aspirating stomach contents into the lungs, eg pregnant women and trauma patients.

The components of RSTI are:

- pre-oxygenate the patient for three minutes;
- make sure the patient is in the best position for any easy intubation;
- make sure that the suction is working, turned on and at hand;
- have a stylette and bougie ready and at hand;
- inject a pre-determined dose of thiopentone over 5-10 seconds, followed immediately by suxamethonium;
- maintain cricoid pressure from the moment the suxamethonium has been injected. Cricoid pressure should not be released until after the cuff of the endo-tracheal tube has been blown up and you are sure that there is no leak present; and
- the anaesthetist should know exactly what to do in the event of a failed intubation (see later).

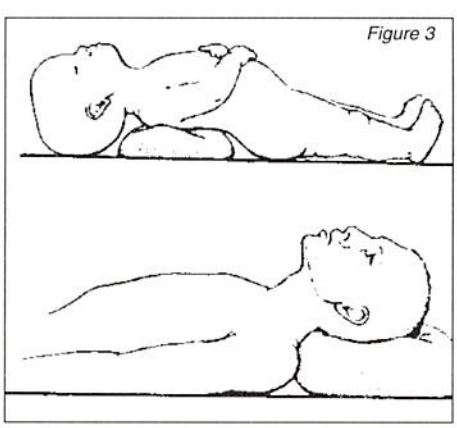


Figure 3: The positions of patients of different ages during intubation.

Children – Pillow under the child's shoulders.

Adults – Flat pillow under adult's head. Avoid too strong anteflexion. Note how the back of the head lies above the level of the shoulders.

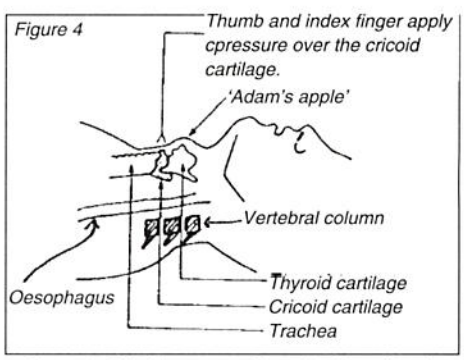


Figure 4: Cricoid pressure. The cricoid cartilage is palpated immediately below the thyroid cartilage. The objective of cricoid pressure is to compress the oesophagus against the cerebral column so that stomach contents cannot enter the pharynx.

THE DIFFICULT INTUBATION

Always anticipate the patient who may be a difficult intubation. Beware the following patients:

- A person with poor mouth opening or restricted jaw opening. Look into the mouth prior to induction – the more you can see of the pharynx, the easier the intubation, eg if you can't even see the patient's fauces you may have an impossible intubation on your plate!
- All pregnant women should be regarded as potentially difficult intubations.
- A person with restricted neck movement for whatever reason;
- a person with a short, thick 'bull neck' (many Zulus).
- A person with protruding incisors.
- A person with oro-pharyngeal soft tissue swelling, eg burns, trauma, dental abscess, angioneurotic oedema, etc.
- A person with a receding jaw.

THE FAILED INTUBATION

You must always have a plan of action to follow a failed intubation. The principles of management are:

- keep the patient well oxygenated.
- ensure that stomach contents are not aspirated into the lung.

In the elective patient you are not concerned about a full stomach, and so you only have to ensure that the patient remains well oxygenated. If you feel that you would not be successful in a second attempt, you can wake the patient. Therefore gently bag the patient with oxygen until the suxamethonium has worn off and the patient starts to wake up from the induction agent and breathes spontaneously.

If you think a second attempt at intubation would be successful, or if you want to wait for a more experienced anaesthetist to have a go, you can keep the patient asleep with Halothane. Gently bag the patient with O_2/N_2O/Halothane until the suxamethonium has worn off and the patient is breathing spontaneously under anaesthesia. When you are ready, give a second dose of suxamethonium and intubate (a repeat dose of thiopentone is obviously unnecessary).

In the emergency patient, remember that the patient should have already been pre-oxygenated. Cricoid pressure must be kept on as the patient is quickly positioned in a head-down and left lateral position.

Manual ventilation is continued with a facemask until spontaneous respiration resumes. This should be done gently in order not to inflate the stomach. If the patient has been well pre-oxygenated you will not have to ventilate very much at all before spontaneous respiration recommences. A decision is then made to either wake the patient, or keep the patient asleep in order to have a second attempt.

You can intubate orally or nasally:

Nasal intubation is mentioned here mainly as a point of interest as it is advisable that it is not attempted unless you have been shown and supervised to do one. It is preferable for oral surgery, and also has the advantage that it can be done blind. This may be useful when you need to intubate a patient with a suspected cervical spine fracture in whom laryngoscopy and passive neck movement should be avoided.

Nasal intubation is often a traumatic procedure and a smaller tube should be used. It should never be attempted in children because of the risk of dislodging the adenoids, and it should be avoided in patients with any significant coagulopathy.

You can intubate with the patient awake:

Awake intubation is rarely required and is also technically difficult. You would consider this technique in any patient in whom you would not want a reduction in conscious level until *after* intubation has been performed.

Such patients fall into two groups:
- patients with upper respiratory tract obstruction (see later); and
- patients who are at risk of vomiting and who are also anticipated as being difficult intubations. However, in such a situation, you should consider transferring the patient. If necessary, techniques for awake intubation can be looked up in a text book.

EXTUBATION

Removing the tube can be as important as putting it in the right place. The main thing you need to know is that the laryngeal stimulation that is produced from the removal of the tube can provoke 'laryngeal spasm'.

This is particularly so for children whose airway may already be compromised by even a small amount of laryngeal oedema.

How do you avoid laryngeal spasm?

Essentially you need to either extubate the patient when he/she is still deeply anaesthetised, or when he/she is well awake. When the patient is deeply anaesthetised you can imagine that the larynx is also deeply anaesthetised and will therefore not react to the tube being pulled out. On the other hand, when the patient is well awake the reflex that causes laryngeal spasm can be overridden. The concern is that when a patient is still semi-anaesthetised, you might provoke laryngeal spasm.

Awake or deep extubation?

Most people would advocate that awake extubation is safest. In other words, wait till the patient coughs out the tube, or allow the patient to

extubate him/herself. This, however, can be uncomfortable for the patient, and it is particularly important to remember that the balloon or cuff has been deflated *before* the tube is pulled out!

In children, however, some people would consider a deep extubation to be safer because, if you wait for the child to wake up and start coughing on the tube, you might cause laryngeal oedema. Since the child's airway is small, even a bit of oedema may be enough to cause significant narrowing and stridor. The disadvantages of the deep extubation is that you can never be 100% sure that the patient is deep enough to avoid laryngeal spasm, and secondly, that you leave the patient with no protective airway reflexes. A deep extubation should ideally be performed with the patient in the left lateral position.

What can you do to maximise safety?

Always give 100% oxygen for a few minutes at the end of the operation. If you run into any trouble you have the maximum amount of oxygen on board the patient, and that will buy you some time.

Always extubate the patient on his/her side. Beware that post-op patients quite commonly vomit. It would be tragic to save a woman from an ectopic pregnancy only to lose her from a severe gastric aspiration.

Always have suction ready and available at extubation.

How do you recognise laryngeal spasm?

The patient is basically suffering from upper airway obstruction. There may be complete airway obstruction in which case respiratory effort is being made, but without any flow of air, and you will notice the paradoxical movement of the chest and abdomen. If there is partial obstruction there will be audible stridor.

What do you do if laryngeal spasm occurs?

Do not panic. Nine times out of 10, the administration of 100% oxygen with a facemask is all that is needed. Just as you start to really worry the patient will take a big breath. Only occasionally do you need to re-paralyse (using suxamethonium) and re-intubate. If this happens, remember all the normal safety procedures for an intubation such as cricoid pressure.

What about suction?

It is a good idea to routinely suck out the pharynx before extubation. The presence of secretions or blood can also act as triggers for laryngeal irritation and spasm.