CHAPTER 13

Therapeutic: Airway – Basic Airway Manoeuvres and Adjuncts

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OVERVIEW

By the end of this chapter you should be able to:

- identify a partially obstructed or blocked airway
- apply a head-tilt/chin-lift and jaw thrust
- describe how to size and insert oropharyngeal (OP) and nasopharyngeal (NP) airways
- describe how to ventilate a patient using a bag-valve-mask technique.

Introduction

Basic airway manoeuvres are life-saving. They are simple to do, easily learnt and should be readily performed by all healthcare practitioners. Airway adjuncts are available throughout nearly all clinical settings; familiarity with their use is vital. Many patients requiring these procedures are critically ill, and senior and/or specialist support should be sought at the earliest opportunity.

The obstructed or blocked airway

It is critical to identify an obstructed or blocked airway and provide immediate intervention. The airway should be assessed using a look, listen and feel approach.

Look for:

- evidence of obstruction in the airway: blood, vomit, foreign body, chewing gum, etc.
- adequate chest movement
- tracheal tug: indicating a completely obstructed airway.

Listen for:

- noisy breathing on inspiration (stridor) or expiration
- the absence of air movement.

Feel for:

- adequate chest movement
- air movement at the lips.

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The airway is most commonly obstructed by the tongue in an unconscious patient – it falls backwards to obstruct the pharynx.

Airway manoeuvres

These manoeuvres are designed to displace the tongue anteriorly, bringing it forward out of the pharynx and clearing the airway.

Indications

- An obstructed or blocked airway.
- To assist in ventilation of an unconscious patient.
- Preparation for or to assist in advanced airway manoeuvres.

Contraindications

- Patients who have potential or actual cervical spine injury should not have a head-tilt/chin-lift as this may exacerbate their injuries: a jaw thrust should be applied as an alternative.

Head-tilt/chin-lift

1. Place the fingers of one hand under the mandible, gently lift the chin forward.
2. Use the thumb of the same hand to depress the lower lip and to open the mouth.

The position you are trying to achieve is the 'sniffing the morning air' position seen in Figure 13.1.

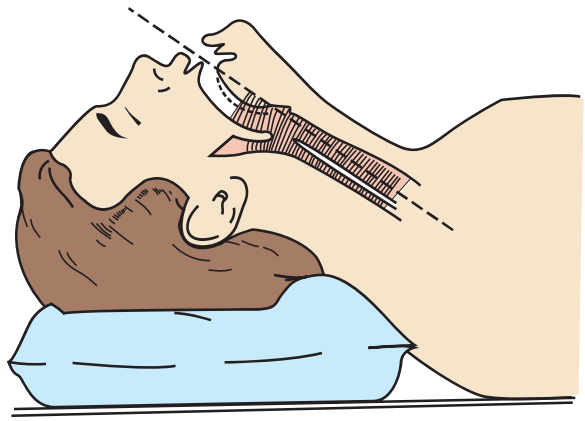


Figure 13.1 An open airway 'sniffing the morning air position'.

Jaw thrust

1 Place the fingers of both hands under the corresponding side of the mandible, at the angle of the jaw.
2 Lift the mandible forwards, opening the airway (avoid moving the patient's head).

Airway adjuncts

Use of airway adjuncts can assist in obtaining or maintaining an unobstructed, open airway.

Oropharyngeal airway

An oropharyngeal (OP) airway is designed to hold the tongue away from the posterior pharynx; this allows passage of air both through the device itself and around it (Figure 13.2).

An oropharyngeal airway consists of three parts: a flange, the body and the tip (Figure 13.3).

The flange protrudes from the patient's mouth. Its shape prevents the airway slipping further into the oropharynx.

The body is made from rigid plastic anatomically designed to fit the contour of the hard palate. It curves over the top of the patient's tongue.

The tip sits at the base of the tongue allowing air passage through and around the airway.

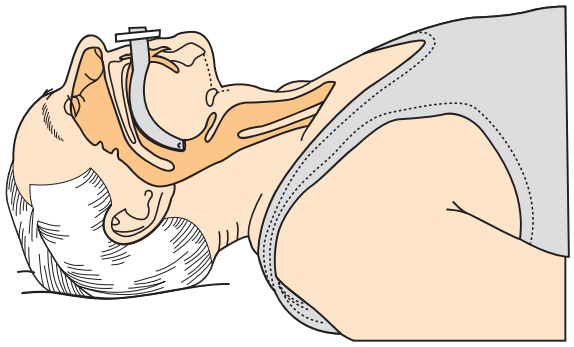


Figure 13.2 A correctly positioned OP airway.

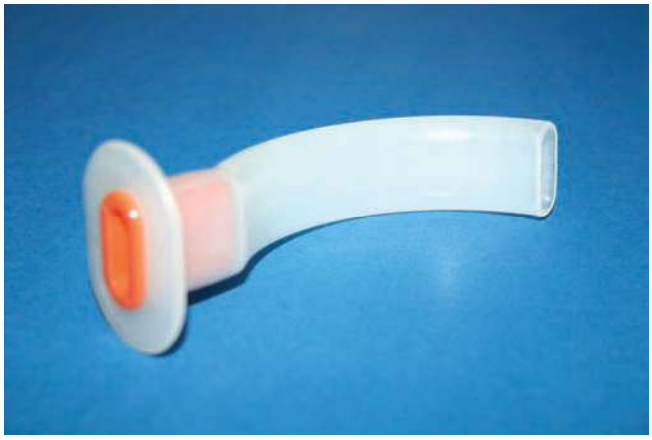


Figure 13.3 OP airway showing flange, body and tip.

Indications

- Maintaining an airway opened by a head-tilt/chin-lift or jaw thrust.
- As an alternative method of opening an obstructed airway when airway manoeuvres have failed.
- As a 'bite-block' to protect an endotracheal tube.

Contraindications

- Patients must be unconscious to tolerate an OP airway. Inserting an airway in a semi-conscious patient may stimulate the gag reflex causing them to vomit, leading to further airway compromise and potential aspiration.

Sizing

- A correctly sized airway will extend from the corner of the patient's mouth to the angle of the mandible (Figure 13.4).
- Improper sizing can cause bleeding of the airway and obstruction of the glottis.

Step-by-step guide: oropharyngeal airway

1 Choose an appropriately sized airway (Figure 13.4).
2 Open the patient's mouth (if an assistant is available get them to do a jaw thrust).
3 Insert the airway upside down, with the curvature towards the tongue and the tip towards the hard palate (Figure 13.5a).
4 When the airway reaches the back of the tongue, rotate the device 180° so the tip faces downwards (Figure 13.5b).
5 Ensure the patient's tongue/lips are not caught between the airway and the teeth (Figure 13.5c).
6 Reassess the patient's airway for patency.

Nasopharyngeal (NP) airway

Similar to an OP airway, the nasopharyngeal (NP) airway is designed to hold the tongue away from the posterior pharynx (Figure 13.6).

The NP airway consists of the flange, the shaft and the bevel (Figure 13.7). All are made of soft flexible plastic to prevent trauma

Figure 13.4 Sizing an OP airway. Measured from the incisors to the angle of the jaw.

(a)

(b)

(c)

Figure 13.5 Step-by-step guide: OP airway. (a) Inserting the airway 'upside down'. (b) Rotation of airway. (c) Final position of airway.

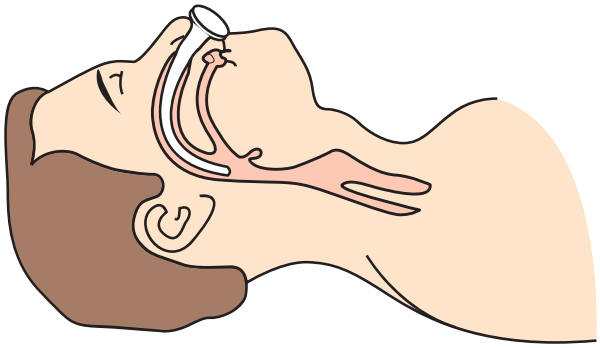


Figure 13.6 Position of a correctly inserted NP airway.

Figure 13.7 Equipment: NP airway and lubricant.

to the patient. Most NP airways require a safety pin inserted through the flange to prevent the airway slipping into the oropharynx.

Indications

- Maintaining an airway opened by a head-tilt/chin-lift or jaw thrust.
- As an alternative method of opening an obstructed airway when airway manoeuvres have failed.
- Better tolerated than OP airways in semi-conscious patients.
- Excellent for use in patients unable to open their mouths (e.g. trismus or seizures).
- As a means of facilitating bronchial suction.

Contraindications

- Known or potential base of skull fracture
- Commonly causes nose bleeds so should be avoided in those patients known to have bleeding tendencies (e.g. on warfarin).

Sizing

- NP airways were traditionally sized choosing a diameter which closest matched that of the patient's little finger (Figure 13.8). A better 'fit' is achieved using the chart in Table 13.1.

Figure 13.8 Traditionally NP airways are sized using the patient's little finger.

Table 13.1 Appropriate-sized NP airways.

Patient	Size of NP (diameter)
Average-height female	6
Average-height male	7
Large male	8

Step-by-step guide: nasopharyngeal airway

1. Choose an appropriately sized NP airway.
2. If necessary, place a safety pin through the flange of the NP (this ensures it does not fully enter the nasal cavity).
3. Apply a water-based lubricant (Figure 13.9a).
4. Insert the NP airway into the right nostril first (unless blocked, nasogastric tube in situ etc.) (Figure 13.9b). The bevel should be on the medial side of the NP airway.
5. The NP airway should be inserted at 90° to the patient's forehead, and should pass with minimal resistance towards the patient's occiput.
6. Rolling the NP from side to side in your fingers as you exert downwards pressure may make insertion easier (Figure 13.9c,d).
7. If resistance is met try the other nostril.
8. Reassess the patient's airway for patency.

Bag-valve-mask (with reservoir)

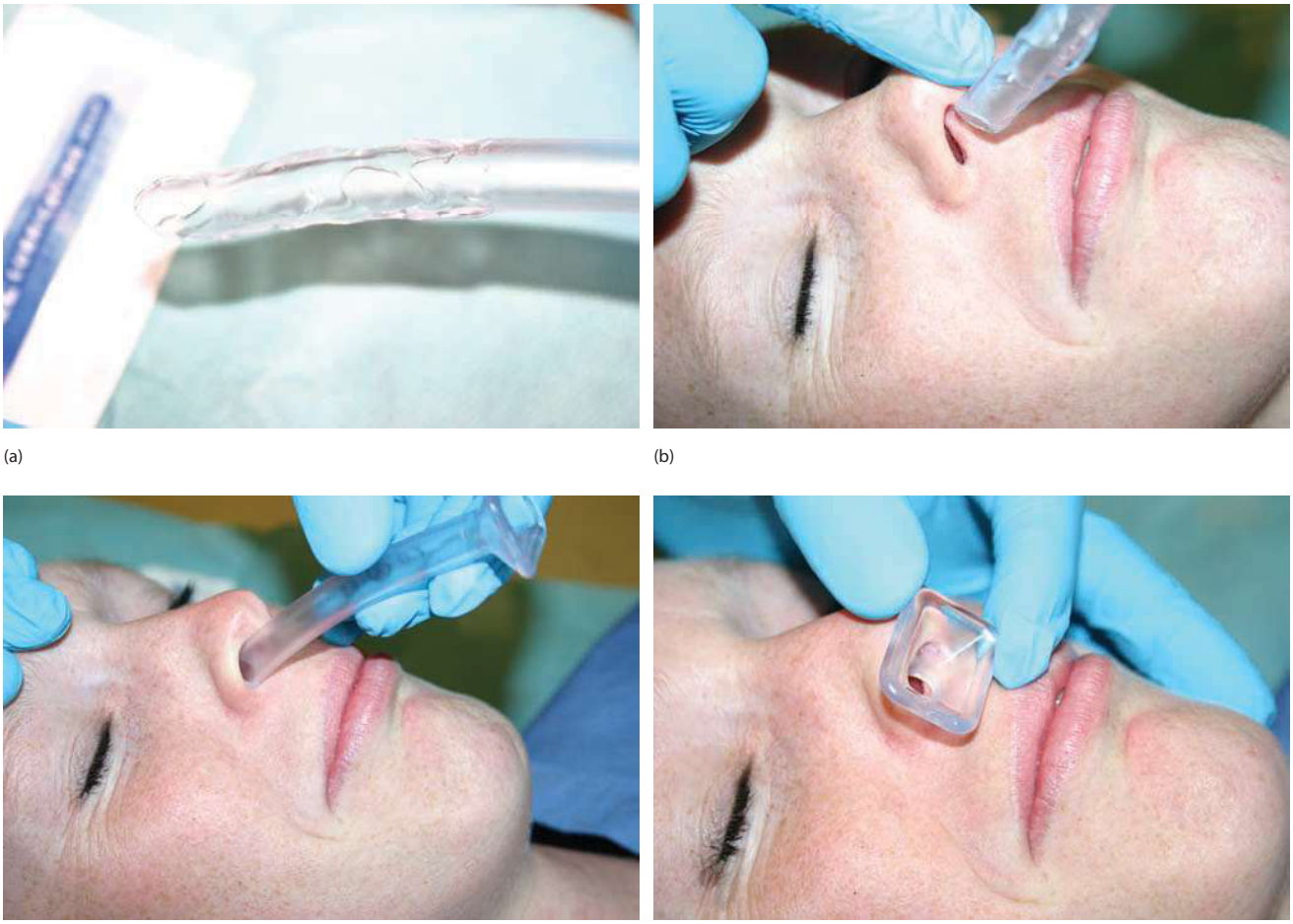
In many patients a simple airway manoeuvre or use of an adjunct to open the airway will allow them to breathe spontaneously. If this is the case high-flow oxygen (15L/min) should be administered via a mask with non-rebreathe reservoir.

If they are not breathing sufficiently it is necessary to ventilate the patient. The most convenient method of achieving this is with a bag-valve-mask with reservoir. This device consists of the following.

- *A tight fitting face mask*. This facemask must be appropriately sized to the patient and allow an airtight seal between the mask and the patient's face.
- *A self-filling chamber*. Usually 2 litres in size, this chamber is self-filling. The chamber will preferentially fill from the oxygen reservoir, but in the absence of an oxygen supply still allows the patient to be ventilated on room air (21% O_2).
- *A one-way valve*. This allows oxygen (or air) to be entrained into the self-filling chamber and then applied as a positive pressure to ventilate the patient.
- *An oxygen reservoir*. This oxygen reservoir fills when the valve is closed and is used to fill the bag when the valve is open.
- *Tubing*. To connect the reservoir and chamber to an oxygen supply.

Step-by-step guide: bag-valve-mask

1. Assemble the bag-valve-mask with an appropriately sized face mask for the patient.
2. Connect the tubing to a high-flow oxygen supply (15L).
3. Ensure the reservoir fully inflates with oxygen.
4. Check the valve is closed and opens when the chamber is squeezed.
5. Place the face mask on the patient ensuring a tight seal (do not remove any airway adjuncts).
6. Apply a head-tilt/chin-lift or jaw thrust to the patient.
7. Squeeze the chamber at a rate of 10–12 breaths a minute.
8. Ensure adequate ventilation by bilateral chest movement and fogging of the face mask on expiration.



(a) (b) (c) (d)

Figure 13.9 Step-by-step guide: NP airway. (a) Lubrication of NP airway. (b) Insertion of airway. (c) Partial insertion: roll between fingers. (d) NP airway in position.

Handy hints/troubleshooting

- A supervised session with an experienced anaesthetist is an ideal environment to learn and practice these life-saving procedures.
- If you have difficulty ventilating a patient use two hands to hold the mask/perform the jaw thrust and get an assistant to squeeze the chamber of the bag-valve-mask.
- Ensure the oxygen reservoir is fully inflated on the bag-valve-mask and connected to the oxygen supply (*not AIR!*).
- NP airways tend to be better tolerated than OP airways in patients with fluctuating consciousness.

Further reading

American College of Surgeons. (2008) Advanced Trauma Life Support: Student Manual, 8th edn.

Dolenska S, Dalal P, Taylor A. (2004) *Essentials of airway management.* Greenwich Medical Media, London.

Resuscitation Council UK. (2006) Airway management and ventilation. In: *Advanced Life Support Course-Provider Manual, 5th edn.* Resuscitation Council UK, London.

CHAPTER 14

Therapeutic: Airway – Insertion of Laryngeal Mask Airway

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OVERVIEW

By the end of this chapter you should be able to:

- understand the indications for inserting a laryngeal mask airway (LMA®)
- be aware of the various types of LMA
- describe how to size and insert a LMA
- understand the benefits and limitations of the LMA.

Introduction

The laryngeal mask airway has an important role in advanced airway management. It is recommended for use in patients requiring advanced life support and is relatively easily inserted by the non-specialist.

Indications

- A first-line airway management device in those with limited airway management experience.
- Airway management in an unconscious patient who requires assisted ventilation in the absence of the ability to provide a definitive airway.
- As an alternative to oropharyngeal and nasopharyngeal airways (more suitable for prolonged ventilation).
- Emergency airway management at a cardiorespiratory arrest.
- Suitable airway device for certain operations/anaesthetics.
- Part of a 'failed intubation' drill (alternative to ET tube).

Contraindications

- When a definitive airway (cuffed tube in the trachea) is required.
- High-risk anaesthetics.
- Patient with fluctuating consciousness level (intact gag reflex is a contraindication due to risk of inducing vomiting).
- Unconscious patients unable to open mouth (e.g. trismus).
- Patients requiring high airway pressure to ventilate (e.g. heavily pregnant, obese, asthmatic).

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Anatomy

The anatomy of the pharynx and larynx has been covered in Chapter 15. The LMA when inserted correctly sits at the interface between the trachea and the oesophagus. Here it forms a low-pressure seal around the glottis (see Figure 14.1).

Equipment

The LMA exists in a multitude of forms. The basic LMA consists of the following (Figure 14.2).

- *15-mm connector*. This is a standard connector which will attach to a bag-valve-mask, ventilator, filter etc.
- *Tube*. An anatomically designed semi-flexible tube. A black line often runs along the back of the airway enabling easy orientation (should face towards the practitioner at the 'head' end).
- *Inflation port*. The volume of air to be injected through this one-way valve can be found in Table 14.1. It is important to note that LMAs are removed fully inflated (unlike an ET tube where the cuff is fully deflated before removal).
- *Aperture bars*. These prevent the airway becoming obstructed by the patient's epiglottis (not universal).
- *Cuff*. An inflatable cuff, anatomically designed to form a low-pressure seal with minimal mucosal pressure.

Variations upon the 'classic' LMA exist which have been designed with additional features:

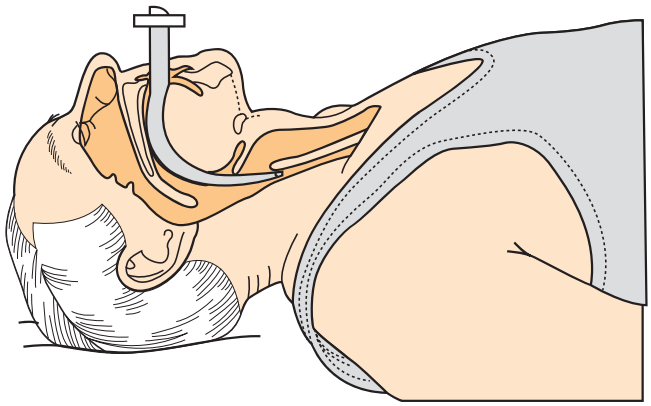

Figure 14.1 The position of the LMA when correctly inserted.

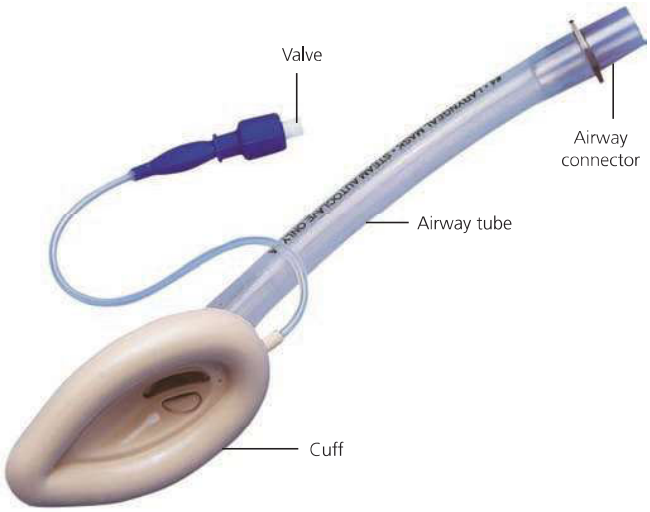

Figure 14.2 A 'standard' LMA.

Table 14.1

LMA size	Type	Weight	Inflation volume
3	Small adult	30–50 kg	20 mL
4	Normal adult	50–70 kg	30 mL
5	Large adult	70 kg+	40 mL

Figure 14.3 Intubating LMA.

Intubating LMA (iLMA®)—A modification of the original LMA through which an endotracheal tube can be passed blindly (Figure 14.3). For use in difficult airways.

Pro-seal LMA®—A drain tube provides direct access to drain stomach contents; this reduces the incidence of aspiration (Figure 14.4).

I-gel® Supraglottic Airway—This variant does not have a cuff that requires inflation. It also incorporates a gastric channel and an integral bite block to reduce the possibility of airway occlusion (Figure 14.5).

Figure 14.4 Pro-seal LMA.

Figure 14.5 I-gel Supraglottic Device.

Sizing

A guide to choosing the correct size of LMA can be found in Table 14.1.

Step-by-step guide: laryngeal mask airway

1. Preoxygenate the patient using the bag-valve-mask technique described in Chapter 13 (Figure 14.6a).
2. Deflate or partly deflate the cuff of the LMA and apply a water-soluble lubricant to the posterior surface of the cuff.
3. Hold the LMA like a pencil in your dominant hand, with the index finger placed at the junction of the cuff and the tube.
4. Place your non-dominant hand on the back of the patient's head. Extend the head (unless cervical spine instability is suspected or known) and flex the neck (Figure 14.6b).
5. Press the tip of the cuff up against the hard palate and flatten the cuff against it (it helps to rotate the cuff slightly laterally at this point).
6. Use your index finger to guide the cuff down towards your non-dominant hand (Figure 14.6c).

Figure 14.6 Step-by-step guide: laryngeal mask airway. (a) Preoxygenating the patient with high-concentration oxygen. (b) Insertion of LMA whilst a trained assistant provides a jawthrust. (c) Insertion of LMA with correct finger position. (d) Advancement of LMA until resistance is felt. (e) Inflation of cuff. (f) LMA secured in position with tape.

7 Advance the LMA into the hypopharynx until a definite resistance is felt (Figure 14.6d).
8 Inflate the cuff with just enough air to obtain a seal. As the cuff inflates it tends to 'pop up' slightly into the correct position (Figure 14.6e).
9 Connect the LMA to your means of ventilation.
10 Confirm adequate ventilation using the 'look, listen, feel' approach described in the previous chapter.
11 Secure the LMA with tape or ribbon.

Handy hints/troubleshooting

- A supervised session with an experienced anaesthetist is an ideal environment to learn and practice this procedure.
- A size 4 LMA is suitable for most females and a size 5 for most males.
- Deflate the cuff fully before use (they are sometimes provided partially inflated).
- If the patient does not tolerate the LMA remove it with the cuff fully inflated.

Further reading

Dolenska S, Dalal P, Taylor A. (2004) *Essentials of Airway Management.* Greenwich Medical Media, London.

Resuscitation Council UK. (2006) Airway management and ventilation. In: *Advanced Life Support Course-Provider Manual*, 5th edn. Resuscitation Council UK, London.