

Part I **Nuts and bolts**

The first section of this book deals with two fundamental aspects of anaesthetic practice: the airway and vascular access.

General anaesthesia has been summarised by the simple phrase *put up a drip, put down a tube and give plenty of oxygen*. Although many anaesthetists resent this glib description of their work, it does have the virtue of emphasising the importance of venous cannulation and control of the airway, which are essential for the safe conduct of anaesthesia. Difficulties arise in anaesthesia when one of these fundamental areas is not secure and, if both fail, then disaster is close at hand.

Therefore, in the first 10 chapters we concentrate on evaluation and control of the airway, the anaesthetic machine and circuits, basic anaesthetic monitoring, vascular access, and the choice of intravenous fluids. We have not given detailed instructions on how to undertake the practical procedures.

There is no substitute for careful instruction from a senior anaesthetist as part of the anaesthetic procedure. At the start of training the application of physiology and pharmacology to anaesthesia is exciting, and knowledge of the equipment may seem mundane and even boring.

It is imperative that you have a basic understanding of the equipment you use – failure to do so will put the patient at risk.

Chapter 1 **Evaluation of the airway**

Experienced anaesthetists teach that there are three fundamental aspects to safe anaesthetic practice: the airway, the airway and the airway. Unanticipated airway problems account for about 40% of overall anaesthetic morbidity and mortality. Therefore, careful airway assessment must be undertaken pre-operatively. This is carried out logically as summarised in Box 1.1.

Box 1.1 Assessment of the airway

- History
- Symptoms
- Examination
 - anatomy and variants
 - medical conditions
 - specific assessment
 - Mallampati scoring system
 - thyromental distance
 - sternomental distance
 - Other tests

1.1 History

Any previous anaesthetic history must be obtained. Information about difficulties with endotracheal intubation may be found in old anaesthetic records. Previous successful intubation is not an indicator of its ease. Some patients carry letters or wear Medic-alert bracelets stating their anaesthetic difficulties, whilst others with major problems know nothing about them. Ascertain whether the airway is potentially difficult by checking whether the patient has any of the medical and surgical conditions listed in Box 1.2.

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Box 1.2 Medical features of difficult airway intubation

- Congenital: rare
- Acquired
 - traumatic: fractures of mandible and cervical spine
 - infection: epiglottitis, dental or facial abscess
 - endocrine: thyroid enlargement, acromegaly, obesity
 - neoplasia: tongue, neck, mouth, radiotherapy
 - inflammatory: ankylosing spondylitis, rheumatoid arthritis
 - pregnancy

1.2 Symptoms

Upper airway obstruction may be found in patients with stridor, dysphagia and hoarseness.

1.3 Examination and clinical tests

Normal anatomy and its variants

Some patients appear anatomically normal and yet are difficult, or impossible, to intubate. These patients cause anaesthetists unexpected problems. We have had the occasional experience of casually starting an apparently normal laryngoscopy, only to have the sinking feeling associated with complete failure to see the larynx. It is much better to anticipate a difficulty than encounter one unexpectedly. Some anatomical factors that make airway control and intubation difficult are listed in Box 1.3.

Box 1.3 Anatomical features of difficult airway control and intubation

- Short immobile neck
- Full set of teeth, buck teeth
- High arch palate
- Poor mouth opening – less than three fingers gap between upper and lower teeth
- Receding mandible (may be hidden by a beard)
- Inability to sublux the jaw (forward protrusion of the lower incisors beyond the upper incisors)

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Specific assessment

Several clinical tests to assess the airway are in common use. None are reliable in predicting a difficult airway or intubation and all should be used in combination as this provides a better overall assessment of the airway.

Modified Mallampati scoring system

This predicts about 50% of difficult intubations. The test can be performed with the patient in the upright or supine position. It is based upon the visibility of the pharyngeal structures with the mouth open as wide as possible (Fig. 1.1). Patients are classified as follows:

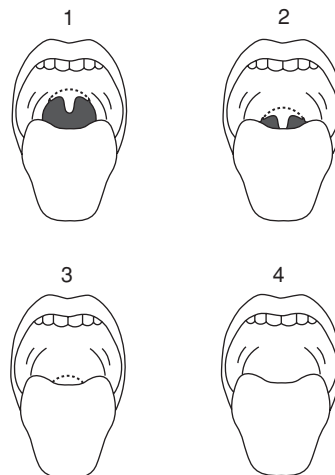


Figure 1.1 Structures seen on opening of mouth for Mallampati Grades 1–4.

- Grade 1: faucial pillars, soft palate and uvula visible
- Grade 2: faucial pillars, soft palate visible, but uvula masked by the base of the tongue
- Grade 3: soft palate only visible
- Grade 4: soft palate not visible

Patients in Grades 3 and 4 are considered difficult to intubate and those in Grades 1 and 2 are considered feasible intubations. It is important to realise that this system is *not* infallible and patients in Grade 2 sometimes cannot be intubated.

Head and neck movement

Flexion and extension are greater than 90° in normal people.

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Jaw movement and mandible

Check that the patient's mouth opens normally. It should have an interincisor gap of greater than 5 cm (about three finger breadths). Check that the patient does not have buck teeth or a receding mandible. Ideally, the lower incisors should be able to be protruded beyond the upper incisors. If these simple tests cannot be performed the airway may be difficult to manage.

Thyromental distance

The thyromental distance (Patil test) is the distance from the thyroid cartilage to the mental prominence when the neck is extended fully (Fig. 1.2). In the absence of other anatomical factors, if the distance is more than 6.5 cm, problems should not occur with intubation. A distance of less than 6 cm suggests laryngoscopy will be impossible and for distances of 6–6.5 cm, laryngoscopy is considered difficult, but possible.

This measurement may predict up to 75% of difficult intubations.

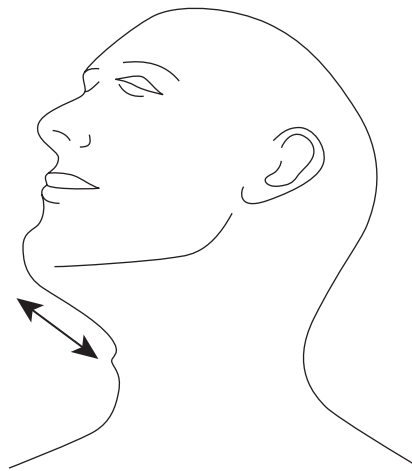


Figure 1.2 Line shows the thyromental distance from the thyroid cartilage to the tip of the chin.

Sternomental distance

This test is claimed to predict up to 90% of difficult intubations. The distance from the upper border of the manubrium sterni to the tip of the chin, with the mouth closed and the head fully extended, is measured. A distance of less than 12.5 cm indicates a difficult intubation.

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1.4 Other tests

Indirect laryngoscopy and various x-ray procedures are occasionally used. Using x-ray photographs the effective mandibular length is compared with the posterior depth of the mandible; a ratio of more than 3.6 may be associated with a difficult intubation. A decreased distance between the occiput and the spinous process of C1 is also reported as associated with difficulties with laryngoscopy. We have found these tests to be of limited value.

1.5 Conclusion

The airway must be assessed before any anaesthetic procedure is embarked upon. Airway control and endotracheal intubation is occasionally difficult, or even impossible, in anatomically normal people. An assessment from the patient's history, symptoms and medical conditions, combined with careful clinical examination, will help avoid most, but not all, unexpectedly difficult intubations.