Assessing the airway

It is more important to be aware of the various methods of dealing with difficult laryngoscopy than to expect to be able to accurately identify the rare difficult patients without predisposing cause.

If you suspect airway problems, get a second opinion before you anaesthetise, not after!

History and examination

Remember to check anaesthetic notes for previous difficulties and ask patients whether they are aware of any anaesthetic problems.

Visual inspection

The following features suggest a difficult intubation:

- obesity
- large breasts
- short muscular neck
- full dentition
- limited neck flexion or head extension (rheumatoid arthritis, ankylosing spondilitis)
- receding jaw
- prominent upper incisors
- limited mouth opening (reduced TMJ mobility, trismus, scarring, fibrosis)
- high arched palate (Marfan's syndrome)
- oropharyngeal infections and tumours
- Stridor (epiglottitis)
- Cervical haematomas (thyroid or anterior cervical surgery)
- acromegaly
- Klippel-Feil abnormalities of the cervical spine
- Pierre-Robin syndrome
- Cystic hygroma
Cormack & Lehane grading

Used to grade the view at laryngoscopy.

• grade I - visualization of entire laryngeal aperture (95%)
• grade II - visualization of posterior part of the laryngeal aperture (4%)
• grade III - visualization of epiglottis only (1%)
• grade IV - not even the epiglottis is visible (0.05%)
Assessing the airway—Predictive tests

Mallampati classification

Patient sits upright with head in neutral position. Mouth open as wide as possible with tongue extended to maximum.

The following structures are visible:

- class I - hard palate, soft palate, uvula and tonsillar pillars
- class II - hard palate, soft palate, uvula
- class III - hard palate, soft palate
- class IV - hard palate

Class I view is grade I intubation more than 99% of the time.

Class IV view is grade III or IV intubation 100% of the time.

May fail to predict over 50% of difficult intubations.
**Thyromental distance**

Measure from upper edge of thyroid cartilage to chin with the head fully extended.

A short thyromental distance equates with an anterior larynx that is at a more acute angle and also results in less space for the tongue to be compressed into by the laryngoscope blade.

Relatively unreliable test unless combined with other tests.

Thyromental distance over 7 cm is usually associated with easy intubation.

Thyromental distance less than 6 cm may predict a difficult intubation.

**Mouth opening**

Less than two fingers width suggest difficulty with intubation.

**Reduced TMJ movement**

Grade A - lower incisors in front of upper incisors

Grade B - lower incisors up to upper incisors

Grade C - lower incisors cannot be protruded to touch upper incisors

**Wilson risk score**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Risk level</th>
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<tbody>
<tr>
<td>Weight</td>
<td>0-2 (&gt;90kg = 1; &gt; 110 kg = 2)</td>
</tr>
<tr>
<td>Head and neck movement</td>
<td>0-2</td>
</tr>
<tr>
<td>Jaw movement</td>
<td>0-2</td>
</tr>
<tr>
<td>Receding mandible</td>
<td>0-2</td>
</tr>
<tr>
<td>Buck teeth</td>
<td>0-2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Maximum 10 points</td>
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</tbody>
</table>

Total of >= 3 predicts 75% of difficult intubations, while a total of >= 4 predicts 90%.

The test has a poor specificity and may fail to predict more than 50% of difficult intubations.

Many of the measurements are subjective.

**Horizontal length of the mandible**

Horizontal length greater than 9 cm is suggestive of good laryngoscopic view.

**Cervical spine movements**

Effect of mobility of atlanto-occipital and atlantoaxial joints on ease of intubation is probably underestimated.

May be assessed by asking the patient to extend the head while the neck is in flexion. Extension of the head with atlantoaxial joint immobility results in greater cervical spine convexity, which pushes the larynx anteriorly and impairs laryngoscopic view.
Prayer sign

Inability to place palms flat together suggests difficult intubation. Probably a reflection of generalised joint and cartilage immobility. May be particularly common in diabetics.

Assessing the airway~Management of expected severe difficulty

Inhalational induction with sevoflurane or halothane is the traditional method.

Inhalational induction can only succeed if the airway is at least partially patent.

Problems can arise with a prolonged excitement phase, and complete obstruction can occur.

Judicious use of an iv agent, such as propofol, and application of CPAP can be helpful.

It is prudent to obtain surgical assistance if an emergency tracheostomy or Crico-Thyrotomy might be difficult.

Some difficulty in mask ventilation is not uncommon in difficult laryngoscopy. The EsmarchHeiberg manoeuvre is made difficult if the cervical spine is rigid and mandibular protrusion is limited.

Awake fibre-optic intubation is the method of choice, and is acceptable to most patients.

Nasal intubation is frequently easier in this group of patients, because of limited mouth opening, and the poor ‘angle of attack’ with the oral route.

The nasal mucosa should be shrunk with xylometazoline (Otrivine®) before endoscopy. Lignocaine is poorly absorbed from the nasopharynx and therefore, toxic reactions are unlikely. The reverse is true of cocaine.

Topical anaesthesia is more effective if glycopyrrolate is given to cut down secretions.

Lignocaine is irritant to the nasal mucosa; initial application should be with a warm 1% solution or 2% gel; 10% lignocaine can then be applied to nasal and pharyngeal mucosa. The glottis is liberally sprayed with 4% lignocaine through the endoscope (about 6 ml).

An alternative is to inject 4% lignocaine through the cricothyroid membrane. Coughing can be very vigorous, but will result in satisfactory anaesthesia. The glottis will not be anaesthetized if the patient does not cough

It is foolish to attempt to pass a tube of greater than 7 mm ID over a fibre-optic endoscope. Metal-reinforced tubes are best, and rotation of the tube as it is passed is helpful.

The administration of sedation during awake fibre-optic intubation is controversial.

Retrograde intubation is an alternative when fibre-optic technology and skill is not available.

An epidural catheter or J-tipped wire is passed through a Tuohy needle into the pharynx, recovered in the pharynx via the cricothyroid membrane, and a tracheal tube is passed over it.

Uncooperative, unconscious or lesser degree of difficulty

Such patients can be managed fibre-optically under general anaesthesia, or with a gum elastic bougie or laryngeal mask airway, as described below.
Assessing the airway—Unexpected difficulty

Gum elastic bougie

This outstandingly useful item should always be ready for use.

• continue exposure of the glottis with laryngoscope throughout
• lubricate only the tip of the bougie. Pass the bougie, suitably bent, before loading a small (6-7 mm) tube
• lubricate the tip of the tube
• rotate the tube 90° anticlockwise as it approaches the glottis
• remove the bougie and laryngoscope
• check the position of the tube

Laryngeal mask airway

In some cases successful positioning of a LMA may be all that is required. If intubation is required, a 6 mm tube can be passed blindly in over half of cases.

Alternatively, a gum elastic bougie can be passed through the LMA, which is removed and a tube passed over the bougie.

A fibre-optic laryngoscope is usually easy to pass into the trachea via a LMA. A 6 mm tube is then rotated into the trachea. The only 6 mm tube of adequate length is the metal-reinforced tube manufactured by Mallinckrodt. This is a very successful technique.

Specially made split LMAs have been constructed to allow larger sizes of tube to be passed and the removal of the LMA.

Blind nasal intubation

Skilful practitioners can achieve a remarkable degree of success.

Taking over ventilation before paralysis in suspected difficult airway

This practice is often recommended to trainees, the rationale being that the “failure to intubate/ventilate syndrome” may be identified before the patient is rendered apnoeic by muscle relaxants.

If the airway becomes obstructed after induction, muscle relaxants are often (in practice) required to allow ventilation.

The “failure to intubate/ventilate” syndrome is very rare, although some difficulty in mask ventilation has been reported in 1 out of 7 cases of difficult intubation.

If difficult mask ventilation is expected, a definitive airway should be placed before induction.

Direct laryngoscopy and the unstable cervical spine

There is no evidence that direct laryngoscopy (and cricoid pressure) is more dangerous than any other method of intubation.

Many patients with severe instability are in cervical fixation devices, which restrict mouth opening and cervical movements.

In these circumstances, awake fibre-optic intubation is probably the method of choice.
Failed intubation in the patient with a full stomach

Repeated unsuccessful attempts at intubation can cause airway obstruction - a mature anaesthetist will admit failure early.

If a gum elastic bougie cannot be passed within 1 minute, serious consideration should be given to abandoning intubation attempts.

Failure to intubate occurs most commonly in obstetric practice (1:200-300 obstetrics; 1:2000 general surgery).

The drill below refers to obstetric patients, but is applicable to all.

The patient has already had preoxygenation, cricoid pressure followed by intravenous induction and suxamethonium.

  • Inform surgeon and call for senior anaesthetic help
  • Maintain cricoid pressure and keep the patient in supine wedged position
  • Insert an oral airway and ventilate with 100% O2
  • Continue to mask ventilate until spontaneous ventilation starts, then turn the patient into the left lateral position, remove the pillow and then release cricoid pressure
  • If mask ventilation is not possible, try the following:
    • reduce (not release) cricoid pressure by half
    • insert a LMA, continue cricoid pressure
    • cricothyroid puncture

Extubation after intubation for airway obstruction

The minimum period of intubation should probably be 24 hours. Adequate sedation must be prescribed, to prevent accidental extubation.

A small tube should have been passed, so that deflation of the cuff and blocking the tube can demonstrate a satisfactory airway.