RECOGNITION AND MANAGEMENT OF DIFFICULT AIRWAY PROBLEMS

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Although the incidence of difficult or failed tracheal intubation is comparatively low, unexpected difficulties and poorly managed situations may produce a life threatening condition or even death. Lunn and Mushin [33] found that four of 58 deaths attributable to anaesthesia were related directly to difficulties with intubation. Moreover, the Confidential Enquiry into Perioperative Deaths [8] study of 1987 revealed that one of the three deaths caused solely by anaesthesia resulted from failure to intubate the trachea. However, these audits referred only to non-obstetric surgical patients in whom the incidence of failed intubation is reported to be 1:2303 [52]. Obstetric surgical patients suffer a far greater incidence, reported to be approximately 1:300 [34]. The reports of the Confidential Enquiries into Maternal Deaths in England and Wales [13-16] from 1973 to 1984 produced the startling conclusion that 41% of the maternal deaths arising from anaesthesia were caused by difficulties with tracheal intubation.

It is clear, therefore, that cerebral damage or death may be the sequela of inadequately managed difficult intubation. Utting [58] stated that "most laymen would regard death associated with anaesthesia as the most serious of all anaesthetic accidents, representing the supreme failure to achieve what the anaesthetist set out to do. However, in some ways the infliction of severe cerebral damage can be worse ... "leaving the patient in a state in which he is unable to care for himself in even the most elementary way".

It is axiomatic that careful preoperative assessment which results in the prediction of potentially difficult airways represents the best method of avoiding disaster. Yet, even the most scrupulous preoperative assessment [65] does not predict every case of difficult intubation. Thus every anaesthetist should be prepared for potential difficulties at all times and be able to follow calmly a rational plan of action if necessary.

PREDICTION OF DIFFICULT INTUBATION

The possibility of a difficult intubation may become apparent immediately at the preoperative interview.

The patient may volunteer information concerning a previous anaesthetic with which difficulty was encountered. Indeed, some patients may carry a "medic alert" warning bracelet or an open letter. It is also essential that the anaesthetist reads the previous clinical records—particularly those associated with anaesthesia. A careful history and clinical examination should elicit the obvious; more specific assessment may reveal other causes of a potentially difficult intubation. A popular, simple and quick test has been described by Mallampati and his colleagues [36]. The test is based upon the pharyngeal structures visible when the patient’s mouth is wide open. Although the original paper described three classes, a fourth was added later by Samsoon and Young [52]. To perform this test, the patient sits upright and directly opposite the examiner. The patient is asked to open the mouth as wide as possible and to extrude the tongue maximally. The observer inspects the back of the mouth, and compares what is seen with the Mallampati [36] classification:

Class 1: Faucial pillars, soft palate and uvula visible.
Class 2: Faucial pillars and soft palate visible but uvula masked by the base of the tongue.
Class 3: Only soft palate visible.
Class 4: Soft palate not visible.

These classifications were correlated with what was visible at subsequent intubation according to the grading system introduced by Cormack and Lehane [12]:

Grade I: Full glottic exposure.
Grade II: Only the posterior commissure of the glottis seen.
Grade III: No exposure of the glottis.
Grade IV: No exposure of the glottis, or of the corniculate cartilages.

Although this type of correlation is attractive, the Mallampati classification predicts only about 50% of difficulties, with a high incidence of false positive results. More recent investigations have shown that many patients involuntarily phonate [42] during the performance of this test, which may significantly alter the Mallampati gradings. There is also considerable variability between observers. Consequently, this test has not proved as reliable as was

KEY WORDS

Airway obstruction Complications: intubation, tracheal. Intubation, tracheal complications, technique, training.
first claimed. Further investigation into the effect of posture on Mallampati gradings has been completed by Tham and colleagues [57]. In essence, they showed that the grading observed with the patient in the vertical position did not change when the patient was horizontal; thus the test is still useful in an emergency when the anaesthetist is presented with the patient supine or with a patient who is unable to sit up.

The unreliability of Mallampati criteria prompted a meticulous study by Wilson and his colleagues [65]. After examination of approximately 1500 patients, 50% of whom were studied retrospectively and 50%, prospectively, a risk score was devised. The five risk factors which contributed to this score were weight, head, neck and jaw movements, mandibular recession and the presence or absence of buck teeth. Each factor has three possible scores (0, 1 or 2) based on set criteria; the total risk score therefore ranges from 0 to 10. A score greater than 2 predicts 75% of difficult intubations, but with what could be considered to be an unacceptable number of false alarms. Increasing the limit to greater than 4 reduces the number of false alarms, but at the obvious cost of missing some difficult intubations. Undoubtedly, a test that would predict 90% or more difficult intubations at a cost of perhaps only 10%, or fewer false positives would be welcomed. However, because of the low overall incidence of difficult intubations this is unlikely to be achieved at the required degree of specificity and sensitivity. Nevertheless, these are important findings; early identification enables the anaesthetist to request the assistance of more experienced staff and to obtain more sophisticated intubation equipment.

Which test is most reliable in clinical practice? A recent paper by Oates and colleagues [43] compared both tests as predictors of a subsequent difficult intubation. Each patient was examined, the Mallampati grading noted and the Wilson score calculated. The predictive powers of both tests were found to be similar but poor. However, they preferred the Wilson risk score for airway assessment because it was associated with less inter-observer variation.

Other clinical findings have been evaluated as predictors of intubation difficulty. The movement of the mandible at the temporomandibular joint can be related to the interdental gap identified by Wilson and colleagues [65], together with subluxation of the jaw (maximal forward protrusion of the lower incisors beyond the upper incisors), as significant risk factors in difficult intubation. In order to achieve sufficient space for forward displacement of the tongue, it seems that not only is full temporomandibular joint movement essential, but also good forward movement of the mandible.

A simple bedside measurement described by Patil, Stehling and Zauder [48] and supported by Mathew, Hanna and Aldrete [38] uses the thyromental distance (distance from thyroid notch to mental prominence when the neck is extended fully) as a predictor of difficult intubation. This single measurement is likely to be influenced by several different factors, such as head extension, position of the larynx and the length and depth of the mandible. If the distance is 6-6.5 cm, without other anatomical problems, laryngoscopy and intubation are predicted to be difficult but possible. A distance of less than 6 cm suggests that laryngoscopy is impossible, while a measurement of 6.5 cm or more suggests that problems should not occur.

Is indirect laryngoscopy useful in prediction? The answer at present is no, and it would be a huge task to undertake the large prospective study that would be required to yield a clear indication. However, this examination may reveal anatomical abnormalities, including obstruction, which would not necessarily indicate a difficult intubation.

Radiological investigation may be of use in predicting a difficult intubation. X-ray measurements in patients with laryngoscopy problems were discussed as early as 1956 [9]. The distances regarded as relevant were the incisor tooth to posterior border of mandible, alveolar margin and the lower border of mandible and the angle of the mandible. Malocclusion was considered also to be a contributory factor. The authors omitted, however, to provide absolute measurements.

In 1975, White and Kander [64] described radiographic predictors of difficult intubation. They found that if the ratio of effective mandibular length to posterior depth of the mandible was greater than 3.6, or if the depth of the mandible was increased or its mobility decreased, intubation proved difficult. Perhaps even more importantly, they reported also that a reduction in both the distance between occiput and the spinous process of C1 (atlando-occipital distance) and, to a lesser extent, the C1–C2 interspinous gap, were each associated with difficult intubation.

Further work by Nichol and Zuck [41] on the anatomical determinants of difficult intubation again stressed the importance of the atlando-occipital distance as an indicator of the ability to extend the head during laryngoscopy and noted that a reduction in this distance may be found in some otherwise normal patients. In 1984, Evans and Cormack [21] proposed a predictive equation linking the atlando-occipital distance with posterior depth of the mandible, with a negative result predicting difficult intubation. More recent work published by Horton, Fahy and Charters [24] demonstrated that lateral radiographs of normal volunteers undergoing laryngoscopy revealed a mean C1–C2 extension of 25°, and that there was a progressive increase in extension from C4 to C1, with atlando-axial extension apparently near the upper limit of normal. Therefore, any limitation of this extension may be expected to cause difficulties with laryngoscopy. In addition to lateral radiography, magnetic resonance imaging has been shown to be useful in identifying these difficult cases [5].

The problem with x-ray investigations is that they are seldom used unless there is a positive indication. Therefore, they do not contribute greatly to prediction in standard clinical practice, although they are of considerable assistance in evaluating the known difficult case.

Although many conditions have been associated with difficulties in intubation, obstetric patients
present a high incidence of difficult or failed intubations. It seems prudent to ascertain why this is so. The incidence may itself be uncertain, because the reporting frequency may be biased by anaesthetists adopting a failed intubation drill earlier than usual. However, although bony anatomical factors remain constant, the soft tissues and their mobility are influenced by pregnancy. These changes may cause problems with intubation either primarily or as a result of secondary effects on the bony skeleton. There may be laryngeal oedema; oedema of pregnancy is common and appears to be caused by the effect of oestrogen on the ground substance connective tissue [25]. There is an increase in total body water and capillary engorgement of the mucosa which causes swelling of the larynx, nasal passages and tongue. The decreased mobility and increased size of the tongue together with laryngeal oedema contribute to difficulties with intubation. Pre-eclamptic patients, in particular, develop widespread oedema of the soft tissues.

There are other reasons why obstetric patients might present a greater incidence of difficult intubation. These patients usually have full dentition which, together with large engorged breasts [28] and an immobile tongue, may hinder the insertion of the laryngoscope. The minimum dose of barbiturate given may be insufficient to augment neuromuscular block and left lateral tilt, used to prevent caval compression, impedes adaption of the "sniffing the morning air" position. Furthermore, over-enthusiastic cricoid pressure may distort the larynx. Any or all of these factors could contribute to difficulty with intubation. Finally, and very importantly, most emergency obstetric anaesthesia is carried out by junior anaesthetists and this may contribute to the greater incidence of difficulty in these patients.

A sound knowledge of anatomical factors is therefore essential. Much work has concerned bony structures and their relevance, but until recently the soft tissues, in particular the tongue, were relatively neglected. Unfortunately, as no single anatomical factor determines the ease of laryngoscopy, none can be used confidently to predict a difficult intubation.

It seems reasonable to conclude that most of the predicted cases of difficult intubation are found after clinical examination and application of simple clinical tests. It is important, therefore, that all patients requiring surgery should be seen by an anaesthetist, preferably the one who will anaesthetize those patients. In circumstances where this ideal cannot be attained, the application of clinical tests enables the examining anaesthetist to grade the degree of anticipated difficulty. This can be communicated clearly to the anaesthetist who is to undertake the procedure itself.

Unfortunately, a small number of patients appear to be normal at clinical examination but subsequently present an extremely difficult or even impossible airway to intubate. These patients are the anaesthetist's nightmare, and ironically tend to present themselves when little extra assistance is available, for example the middle of the night. Such patients have to be managed pragmatically and both failed intubation and ventilation drills have been widely published. The reader is referred to the excellent recent review by King and Adams [30] in which these topics are addressed thoroughly.

**MANAGEMENT OF THE KNOWN DIFFICULT AIRWAY**

If an anaesthetist is presented with a correctly prepared patient who is known to be a difficult intubation risk, what techniques should be considered? Most anaesthetists would attempt to intubate the trachea under sedation and local anaesthesia. This is an interesting choice, as difficult intubation occurs in approximately 1% of all patients [65] and, consequently, the anaesthetist is presented not only with a difficult intubation, but also with a technique which is used infrequently.

The choice of sedative technique remains a matter of personal preference. However, a combination of oral benzodiazepine premedication followed by careful administration of i.v. droperidol and fentanyl are reported to be effective [40].

What nerves should be blocked to produce adequate analgesia in the upper respiratory tract, and what techniques should be used? The main sensory nerves to these areas are derived from the 5th, 9th and 10th cranial nerves [59]. Obviously, all these cranial nerves cannot be blocked and therefore surface analgesia in conjunction with specific nerve blocks must be performed. Surface analgesia may be introduced nasally, orally and via the transtracheal route. The simplest method of analgesia for oral intubation is to use an amethocaine lozenge followed by a "spray-as-you-go" technique [40] using 1% plain lignocaine. Other methods include nebulization of local anesthetic by one of several available methods [26]. However, some of these techniques may be dangerous, as microdroplets may occasionally "flood the alveoli" [39]. Topical application of cocaine remains the most popular agent for surface anaesthesia of the nasal mucosa.

The main nerves that it is necessary to block are the superior and recurrent laryngeal nerves. The former may be blocked percutaneously near the greater horn of the hyoid bone, while the latter may be blocked at mucosal level following a transtracheal injection of local anaesthetic agent—usually lignocaine, but occasionally cocaine. In the interval between injection and onset of anaesthesia, the patient is placed in the most favourable anatomical position for tracheal intubation, spontaneously breathing a high concentration of oxygen through a suitable mask.

The introduction of a tracheal tube may be achieved using methods which involve manoeuvres above or below the cords.

**Methods From Above the Cords**

**Blind nasal intubation**

Historically, the most popular method was blind nasal intubation [51]. This involves placing the head and neck in the classical "sniffing the morning air" position and passing a well lubricated tube into the nasopharynx. The operator listens at the proximal
end of the advancing tube as it approaches and then enters the larynx. The flow of gases associated with ventilation is both heard and felt throughout the manoeuvre. Another useful method would be to attach a capnograph to the proximal end of the nasal tube. The capnographic display of ventilatory pattern as the tracheal tube approaches the larynx may offer directional information while guiding the tube into the trachea. The disadvantage of the blind nasal approach method is the trauma it may produce in the nasal passages, pharynx, larynx or oesophagus. Although the technique is still practised widely, it is certainly not as popular as it was in the past.

Use of a gum elastic bougie

After insertion of a laryngoscope, although the anaesthetist may see only part of the glottis or indeed none at all, it is often possible to pass a bougie blindly into the trachea [31]. The bougie may be solid or hollow. If the bougie is of the solid type and enters the trachea, two things become apparent: first, the stepwise advance of the distal end over the tracheal rings [29] produces a "clicking sensation" and, second, the bougie stops at the tertiary bronchial level. If it is of the hollow type and the proximal end is attached to a capnograph, not only will the same events occur with the passage into the trachea, but the capnograph trace will also show regular variations with ventilation. If neither of these is apparent, it may be concluded that the bougie has entered the oesophagus. However, even if the bougie is in the correct position, the subsequent passage of the tube into the trachea is not always easy. Recently Dogra, Falconer and Latto [18] have recommended that the laryngoscope be kept in the mouth and that the tracheal tube be rotated 90° anticlockwise so that the longest part of the bevel is furthest away from the tip of the epiglottis and thus less likely to impact on the right vocal cord.

Use of fibreoptic instruments

There is no doubt that fibreoptic instruments have become important items of equipment in anaesthesia [11, 19]. Their great advantages are flexibility, ability to pass through either the nasal or oral routes, clear visualization of the cords and subsequent passage into the trachea under direct vision. When used for tracheal intubation via the oral route, the tracheal tube is threaded onto the flexible instrument before insertion. In contrast, if the nasal route is chosen, the tracheal tube is usually, although not always, passed first so that its tip lies somewhere in the naso- or mid-pharyngeal areas. The fibreoptic bronchoscope is subsequently passed through the nasotracheal tube. Thereafter, the sequence of events is the same. The fibreoptic bronchoscope is passed through the vocal cords into the trachea. Many anaesthetists also identify the carina in the distance to confirm that the fibroscope is within the trachea. The tracheal tube is "railroaded" over the bronchoscope into the trachea. The bronchoscope is then removed. However, occasionally, the same difficulties described above may be encountered when the distal end of the tracheal tube is impeded by the tip of the epiglottis or at the cords. This problem may be overcome by the method described above.

Recently, various measurements have been made during fibreoptic intubation. There is no doubt that this method takes at least three times as long [55] as conventional methods. Further, not only is the cardiovascular response to intubation similar to that with standard intubation techniques, but it is also considerably prolonged [53]. This could have potentially serious consequences in some categories of patients, for example hypertensive subjects or those with "berry aneurysms".

Use of a rigid bronchoscope

Although it is feasible to use the traditional rigid Negus bronchoscope for tracheal intubation, it is seldom used for this purpose [60]. It is interesting to note that, although the cords may not be seen with a laryngoscope, they may frequently be seen using a rigid bronchoscope, because of the angle of approach. Many patients have gaps in their molar dentition enabling the bronchoscopist to have a more direct approach to the larynx. A long gum elastic bougie may be passed into the trachea through the rigid bronchoscope which is then removed and the tracheal tube passed as described earlier.

Although the Magill [35] and Mansfield [37] intubating bronchoscopes are more suited than the Negus for this purpose, they are seldom, if ever used, mainly because these instruments are no longer manufactured.

Use of a light wand

A light wand consists of a handle containing a switch and a battery, connected by a flexible tube to a distal light bulb. This equipment is passed inside a tracheal tube until the light bulb just protrudes from the distal end [50]. The patient is normally laid flat with a slight head-down tilt. The surroundings are darkened and the wand passed through the mouth and inferiorly towards the larynx. The cricothyroid membrane is constantly inspected. When there is clear transillumination, the tip of the wand lies just behind the cricothyroid membrane. At this point, the tracheal tube is advanced and the wand withdrawn. The wand is considered to be in the oesophagus if there is no transillumination.

Use of a laryngeal mask airway

The laryngeal mask airway (LMA) has found many uses, including the management of patients with difficult airways, a difficult intubation or a combination of both [6]. When the LMA is in the correct position, a tracheal tube of suitable size may be passed through it. As the distal part of the LMA straddles the rima glottidis, an advancing tracheal tube of suitable size may be passed through it. The disadvantages of the blind nasal approach method are the trauma it may produce in the nasal passages, pharynx, larynx or oesophagus.
Thereafter, with the LMA acting as a guide, the fibrescope is passed into the larynx. With the tracheal tube in place, both the fibrescope and LMA are removed.

**Methods From Below the Cords**

**Retrograde intubation**

There are many different techniques described, but all are based on the retrograde technique described originally by Waters [62]. A Tuohy extradural needle is passed through the cricothyroid membrane into the tracheal lumen. Aspiration of air should be easy and, if the attached syringe is filled with fluid, bubbles should appear. An extradural catheter is advanced through the needle and emerges through either the nose or the mouth. A tracheal tube may be passed over this catheter into the larynx until it arrests against the catheter protruding through the posterior surface of the cricothyroid membrane. As the extradural catheter is cut at the skin edge, the distal end of the tracheal tube tends to spring slightly backwards and may enter the oesophagus. In order to prevent this occurring, the extradural catheter is cut while, at the same time, forward pressure is applied to the proximal end of the tracheal tube. This combined manoeuvre directs the tracheal tube downwards towards the carina. There are many small variations of this technique and these methods are known generally as guided “blind” oral [23] or nasal [17] retrograde intubations. The major difficulty with these methods lies in persuading the tracheal tube to pass the tip of the epiglottis. This may be particularly difficult when the oral route is used.

A modification of this principle is described in this issue of the Journal [54]. The new method uses the cricotracheal membrane in preference to the cricothyroid membrane, claiming a reduced risk of haemorrhage. This membrane is also lower down the respiratory tract so that the angle of advancement of the extradural catheter as it passes cephalad is less steep. This has several advantages. First, the extradural catheter tends to strike the posterior wall of the pharynx before emerging through the nose or mouth. This may help the tracheal tube to avoid the tip of the epiglottis during the subsequent passage. Second, as the extradural catheter enters the airway at a lower level, more of the tracheal tube can enter the trachea, thereby reducing the chance of the distal end of the tube springing backwards out of the trachea when the extradural catheter is cut. As before, the tracheal tube must be advanced firmly as the catheter is cut.

Furthermore, using the cricotracheal approach, the extradural needle is passed as close as possible to the inferior surface of the cricoid cartilage; thus the extradural catheter lies almost flush with its inferior surface. Any traction applied to the catheter is therefore applied to this solid ring of cartilage. With the cricothyroid approach, it is possible that a similar manoeuvre would lead to a vertical split developing in this membrane, particularly if the initial approach was low. During traction, the catheter would move upwards until it eventually came to lie under the thyroid cartilage. This could cause haemorrhage and surgical emphysema. It is possible, therefore, that the cricotracheal approach carries a smaller risk of serious complications.

**Transtracheal ventilation**

This is not technically a method of “indirectly” achieving tracheal intubation. A tracheal tube may be introduced directly into the trachea through the cricothyroid membrane [4, 27, 32, 56]. These tubes are usually in the smaller size ranges and tend to be uncuffed. There are also commercial devices available for this method. Checking that the tube is in the correct position is mandatory before any positive pressure ventilation is introduced; if it is placed incorrectly the introduction of positive pressure ventilation could cause massive subcutaneous emphysema or, very rarely, multiple circulatory emboli. Nevertheless, this method has been used successfully in life threatening circumstances and most difficult intubation boxes or trolleys should have this equipment available.

**Other Clinical Conditions**

There are certain categories of patients in whom sedation and local anaesthesia may not be feasible, for example, children and the mentally retarded. If a tracheal tube is considered mandatory, what techniques are available?

In neonates and small infants, classical awake intubation may be the solution [40]. If not, intubation should be accomplished under general anaesthesia with the patient breathing spontaneously. Under such circumstances, all the methods described earlier can be used.

The recently introduced Bullard [20] laryngoscope utilizes fibroptics and enables the anaesthetist to introduce a guide wire into the trachea under direct vision. Proficiency in the use of this instrument requires considerable experience and therefore it is of little use to the occasional user. It would therefore seem advisable to refer such patients to a specialized paediatric centre.

**Emergency Anaesthesia for Cases of Difficult Intubation**

How may an adult patient, known to present intubation difficulty, be managed when presenting for emergency surgery requiring tracheal intubation? It would seem reasonable to optimize the patient’s clinical condition, the equipment, and anaesthetic expertise.

What can be done to reduce the risks of aspiration associated with intubation? Assuming that adequate time is available, this could be approached in several ways. The first would be to allow the stomach to empty naturally, assisted by a drug such as metoclopramide. However, this is possible only if there is no gut pathology. Second, a nasogastric tube could be passed and the gastric contents aspirated. Third, apomorphine may be administered, but this is very unusual and rarely used. Nevertheless, even if these methods were used it would be impossible to be certain that the stomach were empty. Consequently, the remaining option would be to reduce gastric
acidity and prevent further secretion of acid. Regimens which include antacids and H$_2$-receptor blockers have been used.

The equipment commonly used for difficult intubation should be assembled and checked to ensure that it is in full working order. Under such circumstances a fibreoptic bronchoscope is mandatory [44, 46].

The staff required is easily defined. The anaesthetist most experienced in difficult intubation should be asked to attend and, inevitably, this is the anaesthetist who has the greatest expertise in the use of fibreoptic techniques. An experienced E.N.T. surgeon should also be present as emergency tracheotomy may be required.

There are two options: awake intubation using upper respiratory tract anaesthesia, or tracheotomy performed under local anaesthesia followed by tracheal intubation and general anaesthesia. The choice may be very difficult, but should favour the technique which is considered to provide the safest option.

May an awake intubation be performed under these emergency conditions? Experience is limited, but there is evidence to suggest that it is feasible. Ovassapian [45], albeit in a small series, has recorded his experiences. He argues that if the patient is awake and the upper airway anaesthetized, the lower airway still retains its ability to expel any foreign material. This concept is not universally accepted, but nevertheless has been used successfully. It is possible, although most unlikely, that the other methods described above could also be used.

If fibreoptic bronchoscopy is unavailable or technically impossible, the safest method of securing the patient’s airway may be a tracheotomy performed under local anaesthesia. This is followed by the insertion of a cuffed tracheostomy tube and general anaesthesia.

Finally, it may be interesting to consider the very rare case of a mother at term who is known to present great intubation difficulty but requires a Caesarean section. The logical approach would be to perform a spinal or extradural block. What happens if they fail or cannot be performed? Could tracheal intubation be performed under sedation and local anaesthesia? The answer probably is “yes”. However, additional staff would be required to deal with a sedated neonate who may not breathe adequately for several hours.

**Endobronchial Intubation**

Very occasionally, endobronchial intubation may be difficult and occasionally impossible. Ironically, this may occur after successful rigid bronchoscopy. Normally, the passage of a double lumen tube for thoracic surgery is preceded by rigid bronchoscopy [60]. The reasons for the bronchoscopy include airway inspection, noting any tracheal obstruction or narrowing and the origin of the right upper lobe bronchus. This is particularly important if a right sided tube is to be used.

If endobronchial intubation proves difficult, what additional techniques are available? The first is to use a gum elastic bougie which may be passed down the bronchial side of the double lumen tube until it protrudes through the distal end of the tube. It is advisable to pass as much bougie as possible, leaving only a small length protruding at the proximal end. The gum elastic bougie may be passed into the larynx and the double lumen tube “railroaded” over it. Naturally, this method can be used only if part of the larynx can be visualized at laryngoscopy. The second method is to use a fibreoptic bronchoscope. This instrument is passed through the bronchial side of the double lumen tube. The combination is passed into the mouth and guided under direct vision into the trachea and subsequently into the appropriate bronchus. Whichever method is used, the checking procedure is the same: observation, selective clamping and auscultation. Nowadays, fibreoptic confirmation is used increasingly and would certainly need to be used under the circumstances described.

Single lumen endobronchial tubes should be passed only under direct vision. The only feasible option is to use a fibreoptic bronchoscope [3]. For many years, the flexible bronchoscope was preferred. However, modern engineering has produced a rigid system consisting of two parts. The innermost part is a long telescope fitted with an eyepiece which produces a clear and magnified image. It also carries an attachment for a fibreoptic light source. This telescope is enclosed within a stainless steel cylinder which is exactly the same length as the telescope; the proximal end of this cylinder is expanded to fit a standard tracheal tube connector which in turn is attached to the endobronchial tube. The final combination is therefore the single lumen endobronchial tube with connector on the outside, the stainless steel cylinder in the middle enclosing the rigid fibreoptic telescope.

This combination is passed through the trachea into the appropriate bronchus. The endobronchial tube is held firmly with the left hand while the remainder of the combination is removed. The appropriate cuffs may then be inflated, although some anaesthetists would prefer the “anchor” or tracheal cuff inflated before the rigid components are removed. The position may be checked subsequently by observation, auscultation or flexible fibreoptic bronchoscopy. If all these methods fail, a tracheal tube may be used. However, in the rare cases of bronchopleural fistulae, mechanical ventilation is contraindicated.

**Confirmation**

Regardless of the method used to accomplish difficult intubation, confirmation of correct placement of the tube is essential. The methods of confirmation have been reviewed by King and Adams [30]. The most common are observing the reservoir bag moving with spontaneous ventilation, followed by chest auscultation. It has been found [2] that the preferred auscultation sites are over the upper anterior chest wall on both sides, followed by the bilateral sub-axillary areas. Some anaesthetists would also advise listening over the trachea and hypogastrium.

The second common method involves use of the capnograph. The third method is to use a fibreoptic bronchoscope; if tracheal rings or the carina are visible, the tube must be in the trachea. Other
for such an eventuality. In terms of tracheal intubation in routine, emergency and difficult cases, lack of training must be considered unacceptable.

REFERENCES


