A good plan executed right now is far better than a perfect plan executed next week.

George S Patton

There have been no reported deaths from failed intubation in either of the last two Confidential Enquiries into Maternal Deaths (CEMD). The reason is, almost certainly, due to the increase in the number of regional anaesthetics given for Caesarean section. However, there are concerns that the experience of trainees in managing difficult airways may be significantly affected, partly because of the increase in regional anaesthesia, but also because of factors such as the introduction of the laryngeal mask airway (LMA) and reduced caseload in the first twelve months of training.

This review covers the management of difficult and failed intubation in obstetrics, although it is equally applicable to any situation where there is urgency to continue with surgery, for example, in the case of a patient with a leaking aortic aneurysm.

The incidence of failed intubation is reported to be almost 10 times higher in the obstetric population than in the general surgical population of similar age and it does not appear to have changed significantly from 1984 (0.33%) to 1994 (0.4%). Although diseases such as pre-eclampsia and the increased weight gain of pregnancy may partly explain this difference, other factors such as inadequate anaesthetic experience, psychological strain, failure to assess the airway and the urgency of the procedure may all be relevant. The failed intubation drill has been in use in obstetric anaesthesia for many years. It has also been modified to take into account developments in equipment designed to help in difficult airway management.

Training

Schools of anaesthesia should provide an airway management training programme which includes practical experience in cricothyroid puncture either on mannequins or cadavers.

Key points:

- Difficult intubation is more common in the obstetric population
- Maternal oxygenation takes precedence over everything else
- Every school of anaesthesia must have an airway training programme
- Failed intubation drills must be practised
- A trolley of familiar and essential airway equipment must be available

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Table 1

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the past, it has been suggested that anaesthetists simulate difficult laryngoscopy in normal patients to gain experience in the use of gum elastic bougies, though it is debatable whether this very useful exercise is ethically acceptable in today’s climate.

Although simulators have their limitations, much can be learned by practising failed intubation drills on suitable mannequins. The stress of reality can also be attained by performing mock drills in theatre with an anaesthetic assistant and

Algorithm for management of difficult and failed intubation.
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midwife. As well as bridging the gap between theory and practice, this may highlight organisational aspects that need to be addressed.

**Communication**

Early communication of potential problems between specialties is essential. The morbidly obese parturient, which are increasing in number, should ring the same alarm bells with obstetricians and midwives as does severe pre-eclampsia. Mothers predicted to be at high risk of airway problems should be seen in the antenatal clinic, but ideally in anaesthetic assessment clinics, where plans for early epidural insertion in labour can be agreed.

**Airway assessment**

Every patient presenting for Caesarean section must have their airway assessed. Because of the poor positive predictive value of the majority of the published tests, the anaesthetist is presented with a dilemma when faced with one or more positive results. Each unit or individual should have guidelines for seeking senior help or adopting an alternative to the rapid sequence induction, even if this means delaying surgery. There are situations where the induction of anaesthesia in unprepared emergency patients can be life-threatening.

**Difficult laryngoscopy**

After induction of anaesthesia, there may be difficulty inserting the laryngoscope into the mouth. If the patient is not in the optimal ‘sniffing’ position, they should be repositioned. The enlarged breasts or the hand applying cricoid pressure may impede the insertion of the laryngoscope blade, a situation made worse if the patient’s arms are folded across her chest at the time of induction. The use of a short-handled laryngoscope usually overcomes these problems. In the haste to secure the airway, the inexperienced anaesthetist may also attempt intubation before the fasciculations have ceased, *i.e.* before the suxamethonium is maximally effective. Masseter spasm may occur, in which case, it is usually advisable to abandon attempts at intubation and adopt a failed intubation drill.

The description of the view at laryngoscopy by Cormack and Lehane has proved a very useful tool both clinically and for research purposes. However, in practical terms, the laryngeal view should be optimised with external laryngeal pressure applied in a backward, upward and right sided direction (the BURP manoeuvre). The McCoy laryngoscope may improve the view. Because of the infrequency of general anaesthesia, it is our view that the McCoy blade could be used as the default laryngoscope for all Caesarean sections for training purposes. Once the best view has been obtained, a gum elastic bougie should be tried, feeling for tracheal clicks and eliciting hold-up to confirm tracheal placement. The laryngoscope should be left in the mouth whilst the tracheal tube is railroaded over the bougie into the trachea. Rotating the tube 90 degrees anticlockwise, and using a smaller size (7.0 mm) tube will aid the passage into the trachea. In cases of upper airway oedema complicating pre-eclampsia, a microlaryngoscopy tube might be necessary. Tracheal intubation should always be confirmed by capnography.

Should these manoeuvres fail, a failed intubation drill is adopted and senior help should be sought. All staff in theatre should be aware of the emergency and know their roles (see later).

**Failed intubation**

It is important to recognise early that intubation will not be possible, as repeated attempts to intubate the trachea will cause trauma and increase hypoxaemia. Although it is common practice to draw up two syringes of suxamethonium (in case one falls on the floor), it is unlikely that a second dose will help if intubation was unsuccessful after the first dose. Cricoid pressure should be maintained and the patient left in the supine position with uterine displacement. Tilting the table head down will impair ventilation and may increase the risk of regurgitation. It is critical to oxygenate with a facemask and oral airway, using ‘four hand’ ventilation if necessary. Nasal airways should be used with caution, especially in pregnancy, because of the risk of bleeding. It might be necessary to relax the cricoid pressure since over-enthusiastic application may cause airway obstruction. The priority of maternal oxygenation overrides that of preventing regurgitation. If ventilation is not possible, a failed ventilation drill is adopted.

**Failed intubation and ventilation**

If the incidence of failed intubation is uncertain, the incidence of failed intubation and ventilation is even less certain. It is probably in the order of 1 in 5-10,000. Consequently, any advice on management is at best derived from anecdote and expert opinion rather than results of randomised trials. The LMA is generally agreed to be the most useful device if ventilation fails. A size 4 mask is recommended for most women. The cricoid pressure will need to be released temporarily for the LMA to be inserted to its correct position with the tip at the level of C6/7. On a practical side, two points warrant emphasis. Firstly, how does an anaesthetic assistant open, deflate and lubricate the LMA whilst
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maintaining cricoid pressure? Secondly, the usual practice is to insert the LMA after a dose of propofol that significantly depresses airway reflexes. The first is overcome by identifying a member of staff in theatre to assist the anaesthetic team. Inserting a LMA into the pharynx of a woman recovering from a modest dose of thiopentone may result in coughing, hiccoughing or laryngospasm. The temptation to resolve the second problem by deepening anaesthesia should be resisted.

Once the LMA is in place, cricoid pressure should be reapplied. It has been shown to be effective, at least in cadavers, in the presence of a LMA. It might, however, interfere with ventilation and again it may be necessary to balance the risks of regurgitation against the need for oxygenation.

If insertion of a LMA fails to provide a means to oxygenate the patient, a transtracheal airway must be inserted. The choice lies between a small cannula (about 2.0 mm) with a jet ventilation device or a larger cannula (about 4.0 mm) for use with a self-inflating resuscitation bag or conventional anaesthetic breathing circuit. A small cannula has the advantage of ease of insertion but requires specialised equipment for ventilation. Because of the risk of surgical emphysema if the cannula is misplaced, tracheal placement must be confirmed by first aspirating through the cannula using a fluid filled syringe. Exhalation occurs passively through the mouth but cannot take place if there is complete upper airway obstruction. With the larger cannula, conventional equipment can be used, but insertion is more difficult and potentially traumatic.

Once the patient is oxygenated and the airway is maintained, albeit not protected, the anaesthetist faces the decision as to whether it is necessary to continue with surgery.

To continue or to wake up?

It is important to make this decision before the induction of anaesthesia, as a failed intubation and ventilation situation is not the time to be making such a decision.

In practice, there are only two absolute indications to continue with surgery: maternal cardiac arrest and life-threatening haemorrhage. When the mother has suffered a cardiac arrest, the uterus must be evacuated in order for cardiopulmonary resuscitation to have any chance of success. This can be performed without any form of anaesthesia and should not be delayed until the airway has been secured. In the case of severe haemorrhage, the bleeding is unlikely to be controlled until the placenta has separated.

However, many trainees, and possibly many consultants, will have had little experience of bag and mask anaesthesia in a patient with a difficult airway for an intra-abdominal procedure using only oxygen and a volatile agent. For this reason, the decision to continue should be made only where there is serious threat to the life of the mother.

If it is an elective procedure, or the fetus shows little distress, there is a good argument for waking up the mother and proceeding with a regional anaesthetic technique. What if the mother has a medical problem, such as a coagulopathy or severe obstructive cardiac disease, that precludes a regional technique? In these circumstances there is the option of an awake fibre-optic intubation although whether this is feasible will depend on the availability of appropriate equipment and suitably trained personnel.

Decision made to wake mother up – how to proceed?

When appropriate, a combined spinal epidural is probably the technique of choice in this situation. A reduced spinal dose will minimise the risk a high block in a patient who has already proved impossible to intubate and, provided the epidural top-ups are given incrementally in small doses, the risk of a total spinal is as low as it can reasonably be made.

If an adequate block for surgery is not obtained, then the next option would be to attempt an awake fibre-optic intubation. Should this fail, or be impossible because of lack of equipment or trained personnel, then the options are either a spontaneously breathing technique, surgery under local infiltration anaesthesia or a combination of the two. If the situation has deteriorated to this level, then consideration will have to be given to the dose of local anaesthetics that have been given over the preceding couple of hours.

Decision made to continue

The choice of anaesthetic technique depends on the method of airway management at the time the decision is made. If a LMA is in place, the trachea can be intubated with the help of fibre-optic equipment. A 6.0 mm internal diameter Mallinckrodt reinforced tube is recommended, as it is sufficiently long to ensure that the tracheal cuff will not be inflated between the vocal cords. The technique of fibre-optic intubation through the LMA is very useful and a relatively easy skill to acquire.

If the mother’s airway is maintained with a facemask and oral airway, anaesthesia should be deepened with a high concentration of a non-irritant volatile agent in 100% oxygen. Since the majority of trainees have never used halothane, this
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could require a filled sevoflurane vaporiser to be available in maternity units just for this rare event. If an acceptable airway is maintained, then further instrumentation of the pharynx should be avoided.

Fundal pressure during delivery will increase intragastric pressure and can be minimised by a forceps extraction. Intravenous analgesia should be given carefully after delivery, along with a syntocinon infusion to counteract the uterine relaxation caused by the high concentration of the volatile anaesthetic agent.

**Recovery**

It is well recognised that many problems occur in the period between extubation and full recovery from anaesthesia. The patient should be extubated when awake, on their left side and in a head down position (although it is interesting to note that this is the exact position that radiologists use to encourage oesophageal reflux during barium studies of the upper gastrointestinal tract).

Depending on the location of the maternity unit and the facilities and personnel available, it might be prudent to transfer the patient to the main recovery area, or even the high dependency or intensive care units of the hospital. After a full review by a senior anaesthetist, the patient must be fully informed as to what happened and encouraged to wear some form of warning necklace or bracelet. The hospital notes must clearly identify the problem and the manner in which it was solved. It is best also to write a factual letter to the patient’s, general practitioner with a copy given to the patient.


See multiple choice questions 73–75.
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Key references