

Difficult Tracheal Intubation: Causes, Predictive Tests And Management

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Introduction

Difficult tracheal intubation is defined as inadequate visualization of the glottis and failed orotracheal intubation is inability to insert a tracheal tube from the oropharynx into the trachea.¹ The incidence of failed intubation is higher in obstetric than other surgical patients. Samson and Young described an incidence of 1:280 in the obstetric population and 1:2230 in other surgical patients.¹ Audits of serious complications related to difficult intubation of the trachea indicate the seriousness of the problem and often reflect deficiencies in its management. The outcome of failure to intubate the trachea varies from mere nuisance value to potentially life threatening situations or death.² every anaesthetist has difficulty with intubation at sometime in his or her career although the incidence tends to decrease with increasing experience. The causes and management of difficult tracheal intubation is illustrated with the following case reports.

Case 1

A 23-year-old patient presented to the surgical outpatient department with a 20-year history of anterior neck swelling and a 10-year history of change in voice and difficulty in breathing. Clinical examination showed a huge goitre measuring 30cm x 15cm. An impression of non-toxic multinodular goitre was made and the patient was scheduled for partial thyroidectomy.

Pre-anaesthetic review showed a young man with a thyroid swelling, afebrile and not pale. He was euthyroid. Full blood count was normal and serum urea and electrolytes were within normal limits. Cervical and thoracic inlet x-rays showed retrosternal extension of the goitre. The

cardiopulmonary status was normal. Ear, nose and throat (ENT) review and indirect laryngoscopy revealed compression of the oropharynx by the goitre. The laryngopharynx could not be visualised.

In theatre, attempts to intubate the trachea failed and the patient was reversed. Surgery was postponed and a consultant anaesthetist was informed to take over management of the patient. The patient was rebooked for surgery while the anaesthetic team prepared to tackle a known difficult intubation. Orotracheal intubation with a size 7.0mm, cuffed endotracheal tube was successful this time at first attempt. Anaesthesia was uneventful, recovery was satisfactory and the patient was discharged to the ward.

Case 2

A 37-year-old para 2+0 woman was booked for antenatal care at a gestational age of 20 weeks and normal blood pressure of 120/80 mmHg. Her two previous deliveries were by caesarean section (C/S) due to pre-eclampsia and cephalo-pelvic disproportion respectively. For these reasons she was scheduled for elective C/S at term. The patient, however, presented four days before the date of elective C/S at 38 weeks gestation with complaints of vomiting, epigastric pain and headache of one day duration. Following a detailed history and physical examination, a diagnosis of fulminant pre-eclamptic toxemia was made and she was prepared for emergency C/S.

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Pre-anaesthetic review showed an obese pregnant woman weighing 100kg with a short, muscular neck and height of 1.6m. There was no pallor or jaundice there was bilateral pitting pedal oedema. Blood pressure was 190/110 mm Hg and pulse rate 100/min. Serum urea and electrolyte estimation showed a hypokalaemia of 2.9 mmol/l. Packed cell volume 33% and bedside urinalysis was normal.

An intravenous infusion of half-strength Darrow's solution, 500ml was set up to correct the hypokalaemia. A recheck two hours later showed serum potassium of 3.2mmol/l. Following preoxygenation for five minutes, general anaesthesia was induced with 400mg thiopentone sodium. Suxamethonium, 100mg was given to facilitate intubation. Tracheal intubation was attempted twice but was unsuccessful. The patient then had a cardiac arrest. External cardiac massage was done while administering 100% oxygen by facemask, 0.6mg of atropine was given intravenously. A more senior anaesthetist was called who successfully intubated the patient. The interval between induction of anaesthesia and final intubation was about 30 minutes.

Surgery was commenced and the patient was delivered of a 5.25kg female baby with Apgar scores of 2,2 at 1 and 5 minutes respectively. The baby did not respond to resuscitative measures and died one hour after delivery. Post operatively, the patient failed to regain consciousness. She was however breathing spontaneously with the endotracheal tube in-situ. She was transferred to the intensive care unit where she developed generalized tonic, clonic seizures, went into renal failure and died on the second post-operative day.

Discussion

Difficult or failed tracheal intubation poorly managed, could result in significant morbidity and mortality. In order to facilitate tracheal intubation it is necessary to flex the lower cervical spine anteriorly and extend the head at the atlanto-

occipital joint. This brings the mouth, pharynx and larynx into axial alignment. This is the position described by Magill as that of "sniffing the morning air" and is the ideal position for orotracheal intubation. Several factors may prevent the attainment of this ideal position. These may be factors related to the patient, equipment and anaesthetist.

Patient factors include:

- abnormalities of the cervical spine e.g. fractures, arthritis atlanto-occipital joint dislocation.
- abnormalities of the occiput such as giant teratomas, lipoma, meningoceles, short muscular neck.
- congenital anomalies like Pierre Robin syndrome, Treacher-Collin's syndrome, cystic hygroma, tracheal agenesis etc.
- tumours of the tongue, pharynx, giant goitres
- trismus, mandibular/temporo-mandibular fractures

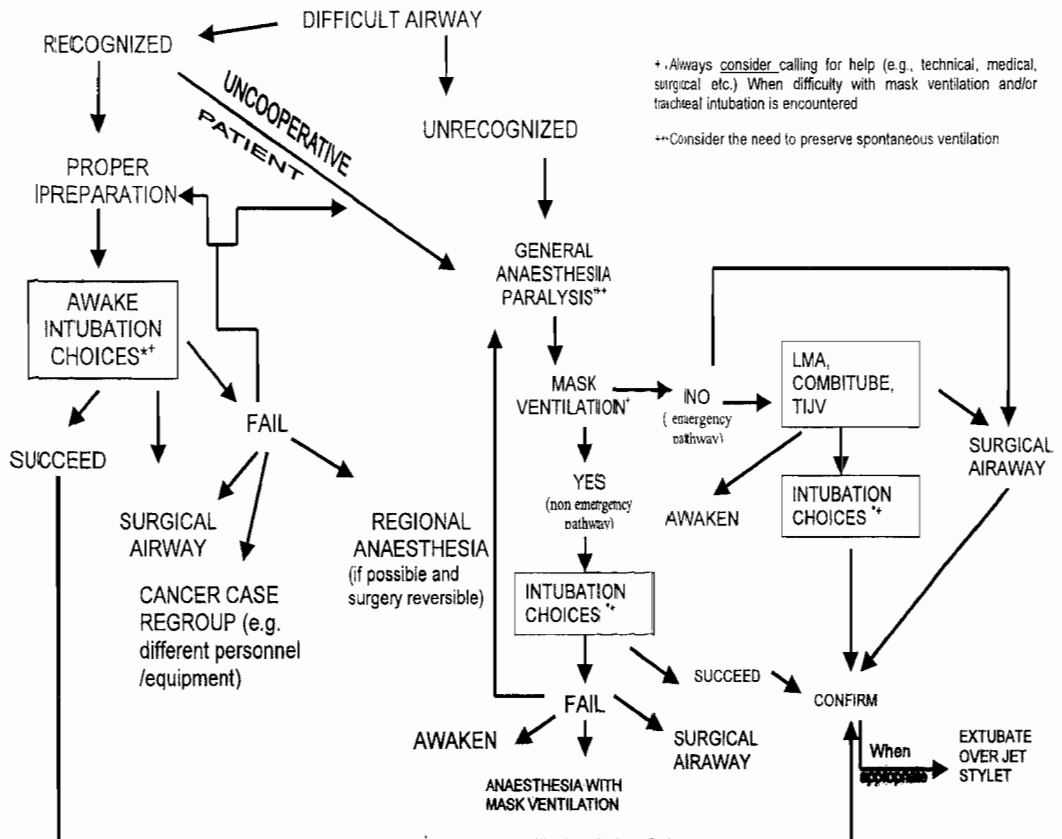
Equipment factors include:

- use of faulty laryngoscope with weak batteries or bulb
- use of inappropriate size of laryngoscope blades or floppy endotracheal tubes without stylet

Anaesthetist factors are commonly due to lack of skill, attempting to intubate unrelaxed and lightly anaesthetised patients and improperly applied cricoid pressure.

In the two cases presented, there were obvious factors militating against the attainment of the ideal intubating position. Difficult intubation should therefore have been anticipated and measures taken to circumvent it. Case 1 had a giant goitre causing compression and displacement of the trachea. Case 2 had a short muscular neck in addition to the generalized oedema of pre-eclamptic toxemia.

DIFFICULT TRACHEAL INTUBATION



*Non-surgical tracheal intubation choices consist of laryngoscopy with a rigid laryngoscope blade (many types), blind orotracheal or nasotracheal technique, fiberoptics/stylet technique, retrograde technique, illuminating stylet, rigid bronchoscope, percutaneous dilatational tracheal entry.

Figure 1: The ASA Difficult Airway Algorithm³

Attempts have been made to quantify or predict difficult intubation using grading systems. These predictive tests range from clinical bedside tests to laryngoscopic and radiological tests. So far, no test is ideal but the Mallampati³ grading system appears to be simplest and most widely used. Mallampati et al³ used inspection of pharyngeal structures to predict difficult intubation. The patient is asked to sit facing the examiner with his mouth fully open and his tongue protruded; *Findings are grouped into classes I-IV*

Class I	-	Soft palate, fauces, uvula and pillars visualised.
Class II	-	Soft palate, fauces and uvula not visualised.
(Class I and II usually pose no problem with intubation)		
Class III	-	Soft palate, base of uvula visualised - intubation difficult but not impossible.
Class IV	-	No structure visualised - usually impossible to intubate.

If an anaesthetist is presented with a patient known to be a difficult intubation risk then planning and preparations can be made. It is the unexpected difficult intubation that is every anaesthetist's nightmare. Because no examination is fool proof, and the signs of a difficult airway may be subtle, the anaesthetist must always be prepared for an unanticipated difficult intubation.

For the known difficult airway, methods include:

- awake intubation under sedation and local anaesthesia
- blind nasal intubation
- use of fiberoptic laryngoscope
- use of intubating aids e.g. gum elastic bougie, light wand, laryngeal mask

airway

- retrograde intubation
- transtracheal jet ventilation

The American Society of Anaesthesia difficult airway algorithm⁴ sums up the management of a difficult airway (Figure 1).

Morbidity and mortality following tracheal intubation is usually not due to failure to intubate the trachea per se but due to failure to stop trying and attend to the resuscitation of the patient. A decision must be taken *early* that intubation is not possible and a failed intubation drill instituted immediately. The following steps are suggested in the drill:

- place the patient head down in the left lateral position;
- maintain oxygenation with 100% oxygen; manual ventilation of the lungs may be necessary until the effects of suxamethonium have ceased.
- allow the patient to waken, and summon help
- when senior help arrives, it may be appropriate to induce anaesthesia again, and to attempt to intubate the trachea using additional equipment such as longer bladed laryngoscope, bougies etc. Alternatively, regional anaesthesia may be employed.

These measures are not suitable if it is essential that surgery proceeds rapidly, such as in foetal distress or maternal haemorrhage. In these circumstances, anaesthesia is probably best maintained as follows:

- maintain cricoid pressure
- place patient in a head-down position
- maintain anaesthesia using 40% oxygen in nitrous oxide and volatile agent (e.g. halothane). Allow the patient to breathe spontaneously when the effects of suxamethonium have ceased.

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