Management of and indications for tracheostomy in care of the critically ill patient

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Abstract

Tracheostomy is a procedure that has evolved over many hundreds of years. In the 21st century, the majority of tracheostomies are now inserted by intensivists in the intensive care unit (ICU). Commonly performed to assist in weaning patients from mechanical ventilation, the procedure is performed using a percutaneous dilatational technique. Percutaneous tracheostomy can generally be performed safely in the ICU, although a number of contra-indications and complications do exist. Recent publications have highlighted weaknesses in the quality of care both in the immediate and longer term. Consequently, a number of organizations, based in the UK and internationally, have turned the focus in recent years to improving the quality of care delivered to these patients. Clinicians caring for patients with tracheostomies should not only be familiar with the indications, anatomy and insertion techniques, but also current guidance on routine care and the emergency management of complications.

Keywords Airway; management; obstruction; percutaneous; safety; trachea; tracheostomy; ventilation; weaning

Introduction

Tracheostomy refers to the formation of a surgical airway in the anterior of the neck. The word is derived from the Ancient Greek words 'tracheia' and 'stoma' (meaning 'opening'). While frequently used interchangeably, the word 'tracheotomy' (Ancient Greek 'tome' meaning 'to cut') strictly refers to the surgical procedure that leads to formation of a tracheostomy.

Tracheostomy has been described in the literature for over 3000 years. Two of the oldest medical texts, the *Rig Veda* (written c. 2000–1000 BC) and the *Ebers Papyrus* (c. 1550 BC), both make reference to 'cutting the windpipe'.[1] A number of notable figures including Asclepiades, Aretaeus and Galen have all been described performing the procedure. Alexander the Great (c. 1000 BC) is reported to have performed one of the first emergency tracheostomies with a sword on a soldier who was choking on a bone lodged in his throat.[2] Hippocrates (c. 400 BC) was wary, however, and condemned tracheostomy due to the risk of severing the carotid arteries. By the second century AD, Antyllus had refined the technique of tracheostomy by using a transverse incision and dividing the trachea at the level of the 3rd and 4th tracheal rings.[2]

Subsequently, numerous reports exist of the procedure being performed throughout Europe, the Middle East and India. However, it remained highly controversial for centuries. Brasavola reported the first successful case in a human in 1546 when he saved the life of a patient with an abscess of the upper airway.[2,3] In the 19th century, Trousseau performed over 200 tracheostomies on children with diphtheria. The mortality was high (c. 75%) but the experience and his acknowledgement of the importance of postoperative care legitimized the procedure.[2] Following advances in anaesthesia, the poliomyelitis epidemic of the 1930s led to renewed use of the procedure in severe cases.

The modern era of tracheostomy began in the 1950s, where it has since found its place as a recognized procedure to aid mechanical ventilation (MV) and relieve airway obstruction. The last few decades have seen significant developments. Percutaneous dilatational tracheostomy (PDT) is now commonplace with the majority of tracheostomies now inserted by this method in ICUs. Both in the UK and worldwide, there has been a strong focus in the last few years on improving tracheostomy care. Internationally, the Global Tracheostomy Collaborative (GTC) launched in 2014 and, in the UK, the National Tracheostomy Safety Project (NTSP) and Intensive Care Society (ICS) provide support and guidance for patients and professionals.

This article will focus on the indications, insertion techniques and management of patients undergoing a temporary tracheostomy in critical care. Relevant recent guidance and publications will be considered. While we will focus on the patient with a temporary tracheostomy in the ICU environment, the principles of routine and emergency management are just as applicable to patients who have undergone emergency or elective surgical tracheostomy or laryngectomy.

Tracheal anatomy (Figure 1)

The trachea is a cartilaginous tube of approximately 10–11 cm in length with an internal diameter of 1.5–2 cm. It originates from below the cricoid cartilage (C6) and extends to the carina (T4) where it bifurcates into the right and left main bronchi. In cross-section the trachea is D-shaped and is surrounded by a number of C-shaped rings which are made of thick cartilage and protect the trachea antero-laterally. Structures anterior to the trachea include the thyroid gland (thyroid isthmus at the level of the 2nd–4th tracheal rings), the anterior jugular veins and inferior thyroid veins. The common carotid artery lies just lateral within the carotid sheath. Immediately posterior is the oesophagus.

Indications for tracheostomy

Broadly speaking, in critically ill patients a tracheostomy is indicated for either: (i) airway maintenance/protection or (ii) provision of ventilation/respiratory care. Examples and details are provided in Table 1. It should be noted that surgical tracheostomy (ST) is sometimes performed pre/postoperatively for patients undergoing major head and neck surgery (e.g. laryngectomy); however, this is outside the scope of this article.

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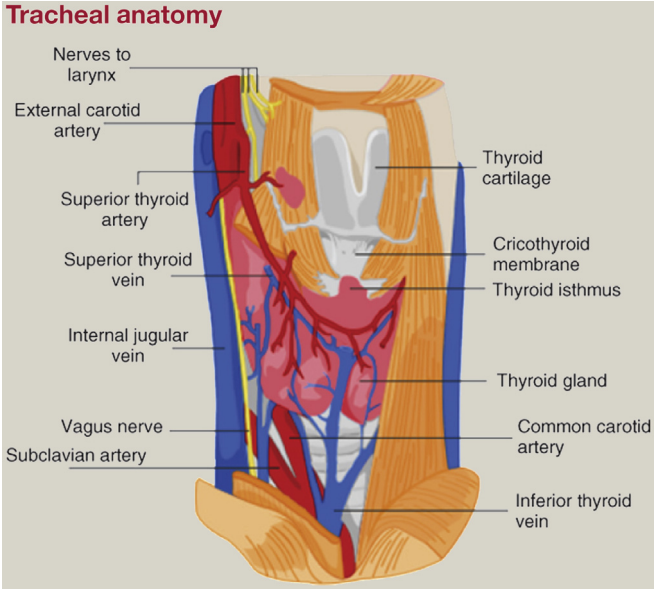

Figure 1 *Reproduced here with permission from e-Learning Anaesthesia (e-LA), Royal College of Anaesthetists.*

Historically, tracheostomies were inserted in ICU patients for the relief of airway obstruction and to mitigate against the adverse side effects of prolonged oral endotracheal intubation on the larynx. However, in recent years tracheostomies are more often than not inserted on a temporary basis — usually to facilitate weaning and effective bronchial suctioning. The reasons for this are twofold: (i) increased experience within the critical care fraternity in the use of PDT and (ii) the general acceptance of the potential benefits of tracheostomy over prolonged endotracheal intubation (Box 1).

Indications for tracheostomy

Airway maintenance/protection	**Example**
Upper airway obstruction	Facial or upper airway trauma Foreign b Infection (e.g. epiglottitis) Anaphylaxis
Unanticipated difficult intubation	
Reduced level of consciousness	Traumatic brain injury Intracerebral bleeding
Loss of airway reflexes	Neuromuscular disease Guillain-Barre syndrome Myasthenia gravis Motor neuron disease
Provision of ventilation/ respiratory care	
Prolonged weaning	Severe critical illness Multi-organ failure Critical illness neuromyopathy Nature of premorbid disease (e.g. severe COPD)
Bronchial toilet	Excessive secretions Poor swallow/cough

Table 1

Potential benefits of tracheostomy

- Reduced sedation
- Better pulmonary toilet
- Improved expectoration
- Better oral hygiene
- Reduced work of breathing
- Faster weaning from artificial ventilation
- Improved mobility
- Potential for oral intake
- Improved communication
- Improved patient comfort
- Reduced delerium
- Reduced ventilator-associated pneumonia (VAP)
- Reduced mortality
- Reduced ICU/hospital length of stay

Box 1

The advantages of a tracheostomy (compared to translaryngeal intubation) can broadly be divided into those which directly benefit the individual patient (e.g. reduced sedation, reduced work of breathing, faster weaning from MV, improved communication and the potential for nutritional intake) and those which may improve critical care outcomes (e.g. rates of ventilator-associated pneumonia (VAP) and mortality or duration of ICU/hospital length of stay).

Timing

The overall effectiveness of tracheostomy is still the subject of debate. While there is general acceptance of the potential benefits, the procedure itself is not without its risks. This leads to the question of *when* is the correct time to perform a tracheostomy in order to derive the most benefit.

A UK-wide national survey in 2005 indicated a wide variation in practice between performance of early (typically <7 days following ICU admission) and late tracheostomy (typically >7 days following ICU admission).[4] A meta-analysis published in 2005 suggested that there may be a reduced duration of MV and hospital stay in patients who receive an early tracheostomy.[5]

In 2013, the TracMan Trial sought to clarify the situation. This large UK-based, multi-centred trial randomized 909 patients to receive either an early (<4 days) or late tracheostomy (>10 days if still indicated). Early tracheostomy showed no improvement in 30-day mortality. Furthermore, the trial highlighted that the ability of clinicians to predict patients requiring prolonged MV was poor; 55% of patients in the late arm of the study never in fact received a tracheostomy.[6]

A recent Cochrane review incorporating the findings of the TracMan study, however, has left the debate open. While the results are not definitive, this systematic review indicates there is likely a lower risk of mortality following early tracheostomy. The reviewers also suggest that early tracheostomy may lead to a reduced period of MV.[7] It is clear, however, that information with regard to outcomes in specific subgroups is very limited.

It is our experience, therefore, to consider an early tracheostomy only if prolonged MV is *highly* likely (e.g. high C-spine injury). In general, we would advise tracheostomy insertion be

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delayed until 10–14 days post intubation and should only then be performed if a further prolonged period of MV is anticipated.

Percutaneous or surgical

The 2014 NCEPOD study estimates that 12,000 tracheostomies are performed in the UK each year.[8] The first PDT insertion was described by Ciaglia in 1985 and it is now estimated that 70% of adult tracheostomies are inserted by this method.[8,9] The PDT method is preferred in the critical care setting for a number of reasons. PDT can be performed at the bedside in ICU by intensivists and hence avoids the risks of transferring a critically ill patient to theatre. Performed 'in-house' in ICU, PDT also avoids the logistical challenges of finding an available surgeon and operating theatre. While a recent meta-analysis showed no difference in mortality or bleeding rates, PDT was shown to be significantly better with respect to infection rates and operative time.[10]

The only absolute contraindications to tracheostomy are patient refusal, severe overlying sepsis and uncontrollable coagulopathy. There are, however, a number of relative contraindications (Table 2). None of these precludes PDT, but these features should prompt consideration of referral for ST or, in the event of severely impaired gas exchange, deferral of the procedure altogether until the situation improves.

It should be noted that with increasing numbers of tracheostomies being performed percutaneously, surgical experience is inevitably declining. The effect of this may be significant, particularly in smaller units, when an experienced surgeon may only be available at limited times.

Preparation for PDT

PDT is usually performed as a planned, elective procedure in the ICU. Prior to the procedure consideration and preparation should be made to address the following: (i) patient; (ii) staff; (iii) equipment; and (iv) difficulty or failure (Table 3).

Patient

Consent and WHO checklist: the 2014 NCEPOD report highlighted a number of inconsistencies in documentation. Critically ill patients rarely have full capacity, hence responsible medical staff should have a good knowledge of the Mental Capacity Act. Ultimately, staff should act in the patient's best interests if they lack capacity. Attempts should, however, be made to explain the procedure and gain their approval if possible. Likewise, the patient's next of kin should also be kept informed throughout.[11] The WHO surgical safety checklist is now a well-recognized tool to surgeons and anaesthetists; however, its use in cases of PDT was variable. A modified WHO checklist should be undertaken routinely.[8]

Considerations and relative contraindications of PDT insertion

Anatomical abnormalities
- Burns
- Trauma
- Thyroid goitre
- Fixed neck
- Obesity
- Aberrant overlying blood vessels

Coagulopathy
Previous tracheostomy
History of neck surgery or radiotherapy
Severely impaired gas exchange (eg. $FiO_2 > 0.6$, PEEP > 10 cmH_2O)

Table 2

Preparing for PDT Insertion

Patient	Equipment
Consent	Routine monitoring (including capnography)
Modified WHO checklist	PDT insertion kit
Adequate depth of anaesthesia	Range of tracheostomy tube sizes
Pre-oxygenation	2% lignocaine with adrenaline
Positioning	Flexible bronchoscope
	Ultrasound
Staff	**Difficulty or failure**
Operator	Difficult airway trolley
Anaesthetist	
Bronchoscopist	
Runner	

Table 3

Anaesthesia and positioning: PDT should be treated like any surgical procedure and therefore adequate anaesthesia is required in order to provide sufficient patient comfort and optimal operating conditions. The specific details are down to the responsible anaesthetist but will generally involve a higher dose of anaesthetic and analgesic infusions than administered purely for tolerance of an endotracheal tube. Neuromuscular blocking agents should also be available. Ventilation and oxygenation should be closely monitored with the patient 'pre-oxygenated' with 100% oxygen prior to the procedure. To optimize access to the patient's trachea the neck should be extended. This is best achieved by placing a one litre bag of fluid between the shoulder blades.

Staff

At least two experienced doctors are required. The designated anaesthetist is responsible for management of the patient's airway, titration of anaesthetic drugs and monitoring and control of the patient's physiological parameters (including oxygenation, ventilation and haemodynamic status). The second doctor is the operator who will perform the PDT. At least one further member of staff (e.g. bedside nurse) who is familiar with the procedure should be available to act as a runner or assistant. Roles and responsibilities should be allocated before the procedure is started. A bronchoscopist is also required, although this role is frequently performed by the anaesthetist.

Equipment (including difficult airway)

Monitoring: all standard intensive care monitoring should be in place and working effectively prior to the procedure. Specifically,

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end-tidal CO_2 ($EtCO_2$) monitoring must be used throughout the procedure and afterwards while the patient is receiving MV.[8] Invasive arterial blood pressure monitoring is recommended given the potential for rapid changes in haemodynamic parameters.

Ultrasound: increasingly, intensivists consider ultrasound imaging prior to PDT insertion to be good practice. The relevant anatomy of the patient's trachea, thyroid and blood vessels can be assessed and potential difficulties anticipated.

PDT insertion kit: the most commonly used technique for PDT in the UK is the 'single stage dilatation' method[4] (see Figure 3). A number of commercially available kits are available (Figure 2). While the kits generally contain a tracheostomy tube it is important that an appropriate tube is selected for the patient. This is particularly important where the patient is obese or has abnormal neck anatomy as 'standard' tubes may be too short. A range of sizes should also be available in case a smaller one is required at the time of insertion.

Bronchoscope: the majority of intensivists perform PDT under bronchoscopic guidance.[4] This offers a number of advantages: (i) provision of light guidance during needling; (ii) confirmation of midline tracheal puncture; (iii) direct visualization may help to avoid posterior tracheal wall trauma; (iv) confirmation from above of tube position within trachea; and (v) confirmation through tracheostomy tube to identify position in relation to carina and to ensure absence of bleeding.

Difficult airway trolley: all ICUs must have a complete and maintained difficult airway trolley that is readily accessible in the event of an emergency. PDT carries the risk of losing the airway and medical staff should be prepared for this eventuality.[11]

PDT insertion

The anaesthetist pulls the endotracheal tube back either under direct vision with a laryngoscope or bronchoscopically until the tracheal tube cuff is between or just above the vocal cords. Using an aseptic technique, the operator prepares the patient's neck with a chlorhexidine or iodine solution. After draping, lignocaine with adrenaline is infiltrated into the skin and subcutaneous tissues in order to reduce bleeding. A horizontal skin incision is made between the cricoid and suprasternal notch. The incision is enlarged with dilating forceps and blunt dissection until the tracheal rings can be palpated. Under bronchoscopic guidance the trachea is cannulated; this not only ensures optimal positioning of the needle in the midline between tracheal rings but also reduces the chance of posterior wall trauma (Figure 3a). A guidewire is passed caudally and the cannula removed.

Several different techniques exist for PDT insertion, all of which use the Seldinger technique to pass a guidewire into the trachea.

- Ciaglia's serial dilatational technique
- Grigg's dilating forceps technique
- single tapered dilatational technique.

Ciaglia's original method involves passing a series of increasingly large dilators over the wire until the stoma is sufficiently large to permit insertion of the tracheostomy tube.[9] In 1991, Griggs described a different method by which dilating forceps are passed alongside the guidewire and into the trachea. Following penetration of the trachea the forceps are opened in order to split the tracheal membrane to the required size for

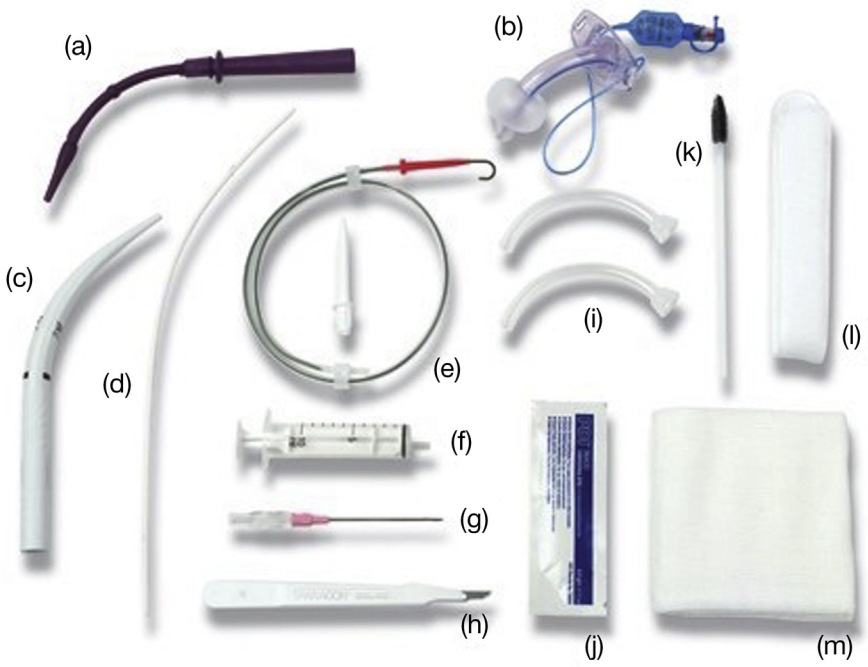

Figure 2 'Portex' Percutaneous Dilatational Tracheostomy Insertion Kit. (**a**) Introducer; (**b**) cuffed tracheostomy tube; (**c**) single stage dilator; (**d**) guiding catheter; (**e**) guidewire; (**f**) syringe; (**g**) introducer needle and cannula; (**h**) scalpel; (**i**) inner cannulae; (**j**) lubricating gel; (**k**) cleaning swab; (**l**) tube tie; (**m**) gauze swabs. (*Image copyright of Smiths Medical*. Reproduced with kind permission.)

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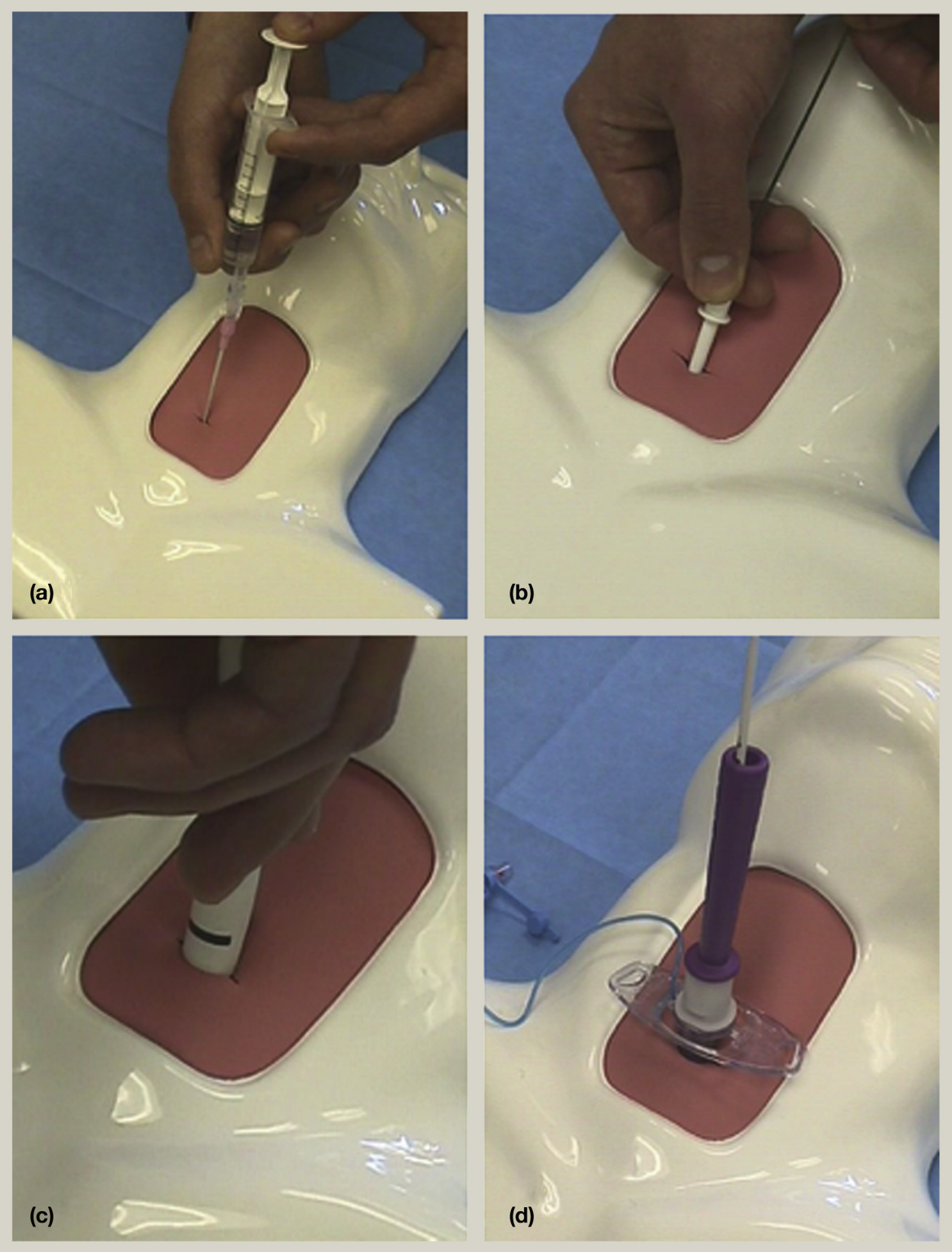

Figure 3 Percutaneous dilatational tracheostomy insertion. (**a**) Cannulation via horizontal incision. (**b**) Small dilator over guidewire. (**c**) Rhino dilator. (**d**) Tracheostomy over introducer. (*Image copyright of Smiths Medical*. Reproduced and adapted with kind permission.)

tracheostomy insertion.[12] Today, the most commonly used method is the 'single tapered dilatational technique'.[4] Initially, a small dilator followed by a rhino dilator is passed in order to enlarge the stoma. Finally, the tracheostomy is inserted through the stoma over an introducer (Figure 3b–d).

Once the tube position is confirmed the ventilator circuit is connected to the tracheostomy and the endotracheal tube removed. If a significant risk exists of the patient pulling out the tracheostomy then sutures may be inserted (although this is not mandatory). Sutures can delay removal of a displaced

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tracheostomy if it is causing airway obstruction. Stitch cutters should therefore be available at the bedside. An appropriate dressing is applied and the tracheostomy secured with ties. Routine chest X-ray is not required in an uneventful procedure. Details of the procedure, including staff involved, technique, complications and details of the tube inserted should be recorded in the notes.

Complications

A number of possible complications exist. These are generally classified as *immediate*, *early* or *delayed* (See Box 2). No clear definition exists for a 'tracheostomy related complication' and so the rate of complications varies in the literature. The latest NCEPOD report found 23.6% suffered at least one complication following tracheostomy insertion; however, not all of these were directly attributable to tracheostomy.[8]

While major complications are relatively uncommon, they may be potentially life-threatening. Therefore, it is important that tracheostomy insertion is supervised by a senior, experienced clinician and that ongoing management of patients is carried out in an appropriately resourced area (most commonly a critical care unit).

Blockage/displacement

The 4th National Audit Project (NAP4) of the Royal College of Anaesthetists identified a significant number of critical incidents in critical care units related to patients with tracheostomies. The report emphasized the importance of end tidal carbon dioxide ($EtCO_2$) monitoring at all times in patients with tracheostomies in order to reduce delay in recognition of tube blockage or displacement.[13] The NTSP have produced guidelines for the management of patients with a blocked tracheostomy which all staff involved in caring for these patients should be familiar with (Figure 4). A copy of these guidelines should also be available above each patient's bed space in conjunction with an emergency tracheostomy kit, including replacement inner cannulae, tube and tracheal dilators.

Key to the prevention of tube blockage are regular suctioning, humidification of inspiratory gases and cleaning of inner cannulae. These measures prevent the development of thick secretions within the tracheostomy tube.

Both partial or complete tube displacement can occur. Partial displacement can be more dangerous as it may not be entirely evident that a problem has occurred. Consequently, staff caring for the patient must be attune to the warning signs of impending blockage or displacement. These include:-

- difficulty passing suction catheter
- evidence of migration of the tube at the skin
- alteration or loss of $EtCO_2$ trace
- need for high cuff pressures
- regular replacement of air to tube cuff
- respiratory distress
- high airway pressures
- agitation
- cardiovascular instability,

In the event of tube displacement, 100% oxygen should be administered via *both* the upper airway and via the tracheostomy while senior help is summoned. Decannulation may be appropriate if the patient is able to breathe comfortably with the tube cuff deflated. Re-insertion of the tracheostomy through the stoma can be considered; however, this should not be attempted in patients whose PDT is <7 days old as the stoma may not have matured and the risk of creating a false passage is high. Re-intubation with an oral endotracheal tube is often the safest option in these situations.

Bleeding

Minor bleeding is not uncommon and can usually be managed with direct pressure and attentive dressing changes. Major bleeding at the time of PDT insertion may be due to inadvertent damage to a major blood vessel (e.g. carotid, thyroid artery) or direct damage to the thyroid. Late bleeding may be due to fistulation between the trachea and a large blood vessel and hence should be taken very seriously even if it is light as this may soon worsen. Prompt examination with a fibrescope should be performed and referral to an experienced surgeon should be made if an arterial bleed is suspected.

General management principles of significant bleeding should be adopted; however, specific attention should be given to ensure the airway is secured. If bleeding occurs peri-procedurally then abandonment of the procedure should be considered and the airway re-secured with an oral endotracheal tube. Depending on the site of bleeding this may require the tube to passed further into the trachea beyond the bleeding point. Over-inflation of the tube cuff may assist in putting pressure on a source of bleeding until surgical evaluation can be made.

Complications

Immediate

- Loss of airway
- Misplaced tube
- Hypoxia
- Pneumothorax
- Surgical emphysema
- Minor/major bleeding
- Cardiovascular instability
- Tracheal cartilage injury
- Posterior tracheal wall damage
- Oesophageal perforation

Early (<7 days)

- Minor/major bleeding
- Hypoxia
- Blockage
- Displacement
- Localized infection
- Pneumonia
- Mucosal ulceration
- Tracheo-oesophageal fistula

Late (>7 days)

- Dysphagia
- Granuloma
- Tracheal stenosis
- Tracheomalacia
- Vocal change
- Cosmetic concerns

Box 2.

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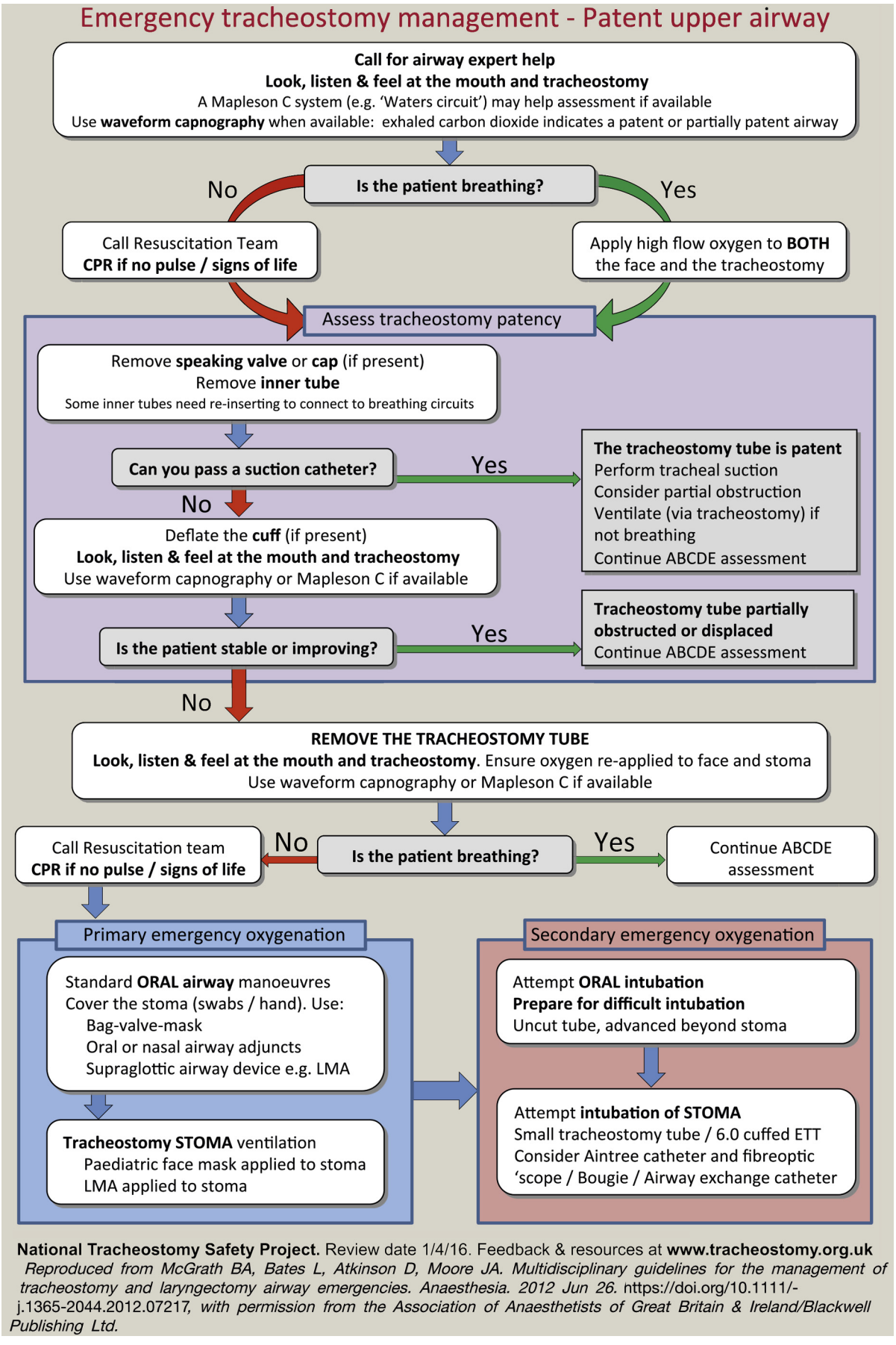

National Tracheostomy Safety Project. Review date 1/4/16. Feedback & resources at **www.tracheostomy.org.uk**

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Figure 4

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Late complications

The most serious late complication is that of tracheal stenosis. This is usually as a result of prolonged contact between the tube cuff and the tracheal wall and is therefore mitigated by ensuring excessive cuff pressures are avoided. Signs of stenosis may not become apparent until the patient is able to exercise sufficiently to generate turbulent airflow within the trachea. Specialist referral to an ear, nose and throat (ENT) surgeon is warranted for further evaluation.[11] Vocal changes and swallowing difficulties often improve with conservative management but can be a cause of significant distress for some patients.

Routine management

A number of issues need to be considered with regard to the routine care of a tracheostomy. The *type of tracheal tube* which is indicated may change with time. The initial tube which is inserted may not be appropriate in the longer term. While a full review of tube types is beyond the scope of this article, we will consider the main factors that influence the type of tube to be used. We will discuss *nursing considerations* including humidification of inspiratory gases, suctioning, dressing and oral nutritional intake. Lastly, we will consider the *organization of care* in relation to routine tracheostomy management.

Tracheal tube types

A multitude of different tube types, shapes and sizes are available on the market. For the vast majority of critical care patients an unfenestrated, cuffed tube with an inner cannula is inserted from the outset. Many patients are able to wean from the ventilator and be decannulated without needing a change of tube. When a change is required, the patient's anatomy and weaning progress should be considered when selecting the appropriate tube. The most common considerations are the need for a cuffed or uncuffed tube, presence of an inner cannula or need for fenestrations.

Following initial PDT insertion, the initial tube should not be changed for at least 7 days to allow the stoma time to become adequately established. They should then be changed at least every 30 days; if an inner cannula is not present then this should be every 14 days.[11]

- Size and shape: The diameter of the tube should be sufficiently large to minimize airflow resistance but also allow sufficient space around it when the cuff is deflated for air to flow out through the larynx. It is also important to ensure the tube is an appropriate length for the patient. This can be particularly important in situations of abnormal neck anatomy (e.g. obese, trauma, burns). If necessary, a tube with an adjustable flange can be used.
- Cuffed or uncuffed: A cuffed tracheostomy is initially used for most patients in critical care. Positive pressure ventilation necessitates a tight seal in the airway around the tracheostomy and the cuff also protects against aspiration into the trachea. In order to reduce the risk of muscosal ischaemia the cuff pressure should be maintained below 25 cmH_2O. Once the patient no longer requires positive pressure ventilation an uncuffed tube may be considered.
- Inner cannulae: Tubes with inner cannulae are generally safer. In the event of blockage, the inner cannula may be removed to relieve the obstruction and can prove life-saving. However, they must be inspected and cleaned regularly to prevent accumulation of secretions in the tube. In patients with particularly high inspired oxygen or positive end-expiratory pressure (PEEP) requirements this may not be possible in which case an inner cannula should not be used.
- Fenestrations: Holes in the tube above the cuff aid in phonation by allowing air to escape through the larynx. These tubes are not usually appropriate for patients requiring mechanical ventilation due to the air leak through the fenestrations.

Nursing considerations

Those caring for patients with tracheostomies must undergo appropriate training in order to provide safe and effective care. All tracheostomy patients should have some form of humidification in order to reduce the risk of thick secretions blocking the airway. Regular suctioning should be performed, the frequency of which is dependent on the individual clinical picture. Staff should ensure the tube remains appropriately secured at all times. Most commonly a dressing is placed around the tube underneath the flange and the tube is secured around the patient's neck with specialist ties. Cuff pressures should be monitored at least every 8 hours and should not exceed 25 cmH_2O.[11] Some patients may be able to safely tolerate oral fluids and nutrition. The tracheal tube cuff may make swallowing difficult and particular care should be taken in patients with underlying neurological disease.

Organizational factors

There has been a strong drive to improve safety and quality of care around tracheostomies in recent years. The 2014 NCEPOD report made several specific recommendations in relation to improving documentation, training and equipment. Critical care units must have immediate access to a difficult airway trolley, fibrescope and clinician with appropriate airway skills at all times. Furthermore, continuous $EtCO_2$ monitoring must be used in all ventilator dependent patients.[8,13]

The NCEPOD report also endorsed the importance of appropriate training, particularly in the emergency management of the blocked or displaced tracheostomy, as published by the NTSP[14,15] (Figure 4).

Following successful PDT insertion there is still much to consider with respect to the routine ongoing care for these patients. NCEPOD has made clear the importance of a dedicated clinical lead and structured multi-disciplinary team (MDT) for ongoing care.[8] While most patients are decannulated in the ITU, a significant proportion will be discharged from critical care with a tracheostomy still in place. For these patients, an organized, structured and well-trained MDT is crucial.

Weaning and decannulation

Weaning is a two-stage process involving the gradual reduction of respiratory support ultimately leading to the removal of an artificial airway. Patients who require PDT insertion usually take a number of days (if not weeks or months) to wean from artificial ventilation. One of the main benefits of tracheostomy is that sedative drugs can very often be stopped entirely, which is thought to speed the process of weaning.

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Correctly predicting the moment to remove the tracheostomy tube (decannulation) is difficult. The decision to decannulate should be made by the MDT and will vary depending on individual patient progress. Prior to decannulation it should be ensured that:

- underlying pathology is resolved
- underlying airway is patent
- respiratory support is no longer required
- patient has an effective cough
- patient is able to swallow secretions
- patient is cardiovascularly stable
- patient is sufficiently alert and pain free.

While usually uncomplicated, decannulation should be undertaken by experienced staff with equipment for immediate recannulation nearby. Emergency intubation equipment and a trained airway expert should be immediately available if required. Nasogastric feeding should be stopped four hours prior to decannulation and the gastric contents aspirated. Following decannulation, the stoma site should be dressed and allowed to heal by itself. The patient should be observed for 24 hours prior to discharge to a ward. Further follow-up should be arranged for all patients who have undergone tracheostomy.

Summary

Tracheostomy insertion may be indicated in critically ill patients to assist in weaning from mechanical ventilation or to aid bronchial suctioning. In the ICU, the procedure is performed by a well-established percutaneous dilatational technique. In recent years, attention has turned to improving the quality of care for patients with tracheostomies. In addition to the process of tracheostomy insertion, clinicians should be familiar with routine management practices and, in particular, emergency guidelines. ◆

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