Bite-sized training from the GTC

Section 3.1
Tracheostomy complications

This is one of a series of bite-sized chunks of educational material developed by the Global Tracheostomy Collaborative. The GTC has developed up-to-date resources from international experts for the safe management of patients with tracheostomies. Within these sections are links to established resources, institutions and relevant websites, as well as some our own educational videos, links, images and animations.

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Complications associated with tracheostomies & laryngectomies.

Complications associated with a tracheostomy

Complications can be divided into those associated with insertion of the tracheostomy (surgical or percutaneous), those which arise following the procedure (usually blocked or displaced tracheostomy tubes) or later complications. These can be serious and sometimes fatal. These complications are usually grouped as follows:

1. Immediate Complications (peri-operative period)
   - Haemorrhage (usually minor, can be severe if thyroid or blood vessels damaged).
   - Misplacement of tube - within tissues around trachea or to main bronchus.
   - Pneumothorax.
   - Tube occlusion.
   - Surgical emphysema.
   - Loss of the upper airway.

2. Delayed Complications (post-operative period < 7 days)
   - Tube blockage with secretions or blood. May be sudden or gradual.
   - Partial or complete tube displacement.
   - Infection of the stoma site.
   - Infection of the bronchial tree (pneumonia).
   - Ulceration, and/or necrosis of trachea.
   - Mucosal ulceration by tube migration (due to loose tapes or patient intervention).
   - Risk of occlusion of the tracheostomy tube in obese or fatigued patients who have difficulty extending their neck.
   - Tracheo-oesophageal fistula formation.
   - Haemorrhage (local tissue trauma or erosion through blood vessels)

3. Late Complications (late post-operative period >7 days)
   - Granulomata of the trachea may cause respiratory difficulty when the tracheostomy tube is removed.
   - Tracheal dilation, stenosis, persistent sinus or collapse (tracheomalacia)
   - Scar formation-requiring revision.
   - Blocked tubes may occur at any time, especially if secretions become thick, the secretions are not managed appropriately (suction) and humidification is not used.
   - Haemorrhage
Complications, Red Flags & Emergencies

Potential problems post placement

Blocked Tracheostomy

One role of the upper airway is to moisten and warm inhaled air before it reaches the lungs. Cilia are small hair-like protrusions that line the respiratory tract; the function of the cilia is to prevent infection within the respiratory tract by moving mucus and other particles away from the lungs. Inserting a tracheostomy tube bypasses these natural mechanisms, which mean the lungs will receive cool, dry air. Dry air entering the lungs may reduce the motility of the secretions within the lungs and may reduce the function of the cilia. In addition, the patient may not be able to cough and/or clear the secretions from their airways through the tracheostomy. This may cause the tracheostomy to become blocked by these thick or dry secretions. Blocked tracheostomy tubes can be minimised by careful humidification, tracheal suction and inner tube care. However, it is necessary to keep emergency equipment at hand at all times as a blocked tube may lead to respiratory arrest.

Pneumonia

A build up of secretions may lead to consolidation and even collapse of some areas of the lung, and thus contribute to pneumonia. The presence of a foreign body in the airway will hamper normal physiological defence mechanisms and particulate matter, oral secretions, gastric contents and bacteria can be aspirated past any cuff into the airway. These risks can be minimised by careful humidification, tracheal suction and inner tube care, and may be helped by suctioning above the cuff with specific subglottic suction tubes. Aspiration of gastric contents may also lead to pneumonia. This can occur with patients who are unable to swallow safely. Any patient who you suspect may have aspirated will need to have a formal swallowing assessment.

Displaced Tracheostomy Tube

The tracheostomy tube can become partially or completely displaced. The tube may migrate out of the stoma or into the soft tissue of the neck. The tube may become displaced by coughing, because of its weight or the weight of attached breathing circuits, or by patient interference. Partial tube displacement is more dangerous as it is not always visibly obvious that there is a problem with the tube. In order to keep tracheostomy tubes in position they must be secured carefully.
Complications, Red Flags & Emergencies

and monitored. Any concerns raised by the patient or nursing staff must be promptly investigated.

Haemorrhage

It is common for some bleeding to occur after a tracheostomy has been performed. This usually settles with a few days. Bleeding can occasionally be significant or even catastrophic. Bleeding can be from the trachea, stoma or surrounding tissues and can be due to direct trauma of the tissues, puncture or injury to adjacent blood vessels or the tube or cuff eroding into surrounding tissues or vessels over time. Bleeding can also come from the lungs themselves and become evident through tracheal suction. These problems are compounded in a patient with a coagulopathy.

A trachea-innominate fistula can occur if the tube erodes into the innominate artery. This is a rare complication but is associated with lower placement of the tube in the trachea. The hallmark is a warning or ‘sentinel’ bleed. Any haemorrhage should prompt a fibreoptic inspection of the trachea. If an arterial bleed is suspected, this should occur immediately with an experienced surgeon and resuscitation measures available. Arterial haemorrhage can become rapidly fatal. Hyperinflation of the tracheostomy tube cuff or an endotracheal tube cuff may help to tamponade the bleeding point, prior to definitive surgical management.

Tracheostomy Red Flags

Most healthcare workers will be familiar with the descriptions of critical incidents that developed where warning signs were often present and sometimes recorded, without their significance being recognised. Tracheostomy red flags may be clues that a problem has, or is about to occur and need to be acted upon. Prompt assessment by someone competent to do so is required and a fibreoptic inspect of the position of the tracheostomy tube to confirm correct placement within the trachea is usually indicated. All staff caring for patients with a tracheostomy should be familiar with these warning signs. Red flags and emergency management is discussed later in this chapter.

Red flags include:

1. Airway
   a. The patient with a cuffed tracheostomy tube suddenly being able to talk (implying gas escaping proximally and the cuff no longer ‘sealing’ the trachea)
   b. Frequent requirement for (excessive) inflation of the cuff to prevent air leak
c. Pain at the tracheostomy site
d. A suction catheter not passing easily into the trachea
e. A changing, inadequate or absent capnograph trace

2. Breathing
   a. Increasing ventilator support or increasing oxygen requirements
   b. Respiratory distress
   c. Surgical (subcutaneous) emphysema (gas in the soft tissues)
   d. The patient complaining that they cannot breathe or have difficulties in breathing
   e. Suspicion of aspiration (feed aspirated on tracheal toilet – suggests that the cuff is not functioning adequately)

3. Circulation or any other general clinical deterioration
   a. As with all assessments of the acutely unwell patient, an ABCDE assessment includes ensuring that the airway is patent. In this case, this includes assessment of the tracheostomy tube.

Local Infection

The stoma is an open surgical wound and there is always a risk of site infection, with the ever-present threat of introducing organisms from the sputum. A stoma should be treated as a surgical wound and cared for appropriately. Careful observation, keeping the wound clean and dry with regular dressings changes will help to reduce the incidence of infection. Prompt swabbing and appropriate topical and systemic antimicrobial treatment will help to minimise the impact of local infection. As the stoma is an open wound opening directly into the respiratory tract there is potential for the lower respiratory tract to become infected. Poor suction technique may also increase the incidence of infection.

Tracheal Damage/ Ischaemia

Damage to the trachea may be caused by the pressure of the inflated cuff pressing on the mucosa of the trachea. The capillary pressure in the tracheal mucosa is around 20 cm H₂O and consistent cuff pressure above this limit will risk ischaemic damage to the trachea. This situation may be made worse by critical illness and hypotension, which will reduce the capillary perfusion pressure. Direct mucosal damage can also occur by poor tracheal suctioning techniques, ill-fitting tubes, or excessive movement of the tube within the trachea. Modern tracheostomy tubes have low-pressure cuffs which extend over a greater surface area, however over-inflation should still be avoided. The pressure in the cuff should be just adequate to prevent air leakage and seal the airway against aspiration.


**Altered Body Image**

This is an important factor as it can have a major psychological impact. If possible the patient should have careful pre-operative explanation. If this is not possible the patient must receive explanation and support post-operatively. The patient should know that scarring would usually be minimal when the tracheostomy is removed and the stoma has healed. One of the most frustrating aspects for patients, especially those waking from an induced coma, is that they are unable to speak when the tracheostomy tube cuff is inflated. As soon as possible, the patient should be reassured that speech will return. Most stomas will heal well provided that the general condition and nutritional status of the patient is good, and the stoma is kept dry and infection free. The diameter of the stoma may be expected to shrink by around 50% in the first 12 hours following removal of the tube. Stomas may heal completely in as little as 3 to 4 days, but may take several weeks. On average the stoma will close and heal within 4-6 weeks.

**Communication**

Patients with a cuffed tracheostomy will be unable to speak; loss of speech whilst the tracheostomy is in place could cause great distress to the patient, even if warned beforehand. This can cause fear because of inability to attract attention or anxiety due to inability to communicate (even with the cuff down). Generally patients who have an un-cuffed tube or the cuff deflated will be able to speak with a speaking valve in place. Communication aids such as pen/paper or picture cards are vital to prevent the patient feeling frightened and isolated. In addition ensure the patient has a nurse call bell at all times.

**Speaking valves**

These are one-way valves that fit over the end of the tracheostomy tube. They allow the patient to breathe in through the tracheostomy, but not out. The airflow has to go up through the larynx and out of the mouth. This can allow the patient to talk, but can be tiring for the patient due to increased resistance to airflow. Click here for an animated presentation showing airflow when speaking valves are used. Because air cannot flow out through the tracheostomy, these valves can be extremely dangerous. Speaking valves should ideally only be used with an un-cuffed and fenestrated tube and only when the fenestrated inner cannula is in place. It is possible to use with a non-fenestrated or even cuffed tube, providing that the cuff is deflated. If a speaking valve is used with a standard tube with the cuff deflated, this is
potentially hazardous and should only be used by staff with the experience and the necessary infrastructure to recognize and immediately manage any resulting complications.

A speaking valve in situ with a cuffed tube. The cuff must always be deflated otherwise the patient cannot exhale and will asphyxiate.