Tracheostomy

Introduction

When a tracheostomy is performed, an opening is created in the trachea to help airflow. This opening may be temporary in which case a tube is normally inserted to maintain the opening while it is required. Less commonly the tracheostomy may be permanent in which case a surgical stoma is usually created.

By allowing air to enter and leave the respiratory tract at the level of the trachea, any obstruction in the larynx, pharynx, mouth or nose is effectively bypassed.

Indications

Temporary tracheostomies are usually performed in an emergency situation. If a dyspnoeic animal is presented with an upper airway obstruction and is not maintaining adequate ventilation, it is important to establish a clear airway and intubate. If intubation is impossible, then a tracheostomy can be performed as an emergency procedure. In the majority of these cases intubation is possible, and a tracheostomy can be performed in a more controlled fashion with more thorough preparation. Bear in mind that a tracheostomy will only be of use if it is distal to the obstruction.

Emergency presentations might include laryngeal or tracheal trauma (especially dog bites), pharyngeal or laryngeal foreign bodies, or laryngeal paralysis.

Selection of an Appropriate Tube

There is a wide variety of tracheostomy tubes available. A lot of the tubes available are designed for human use and may cause problems due to difficulties in securing and retaining in place in our patients. Human tubes may also not conform well to the shape of the canine or feline trachea.

Tubes need to be made from a non-irritant material that can be autoclaved. Most tubes are made from PVC or silicon, materials such as stainless steel or nylon are not commonly used today.

The tube itself has a number of components that may vary with manufacturer or intended purpose. The outer cannula is placed in the trachea and remains in position at all times, it may contain an inner cannula that can be removed from the tracheostomy tube for routine cleaning and then re-inserted into the outer cannula. While an inner cannula greatly assists in the post-op management and cleaning of the tube, it obviously narrows the internal diameter of the tracheostomy tube, so increasing resistance. The flange or neck plate sits outside of the trachea on top of
the skin, it usually has holes to attach ties or sutures to so the tube is held in place. The part of the tube that sits outside of the trachea is usually a standard sized connector to allow anaesthetic circuits to be connected directly. Some tracheostomy tubes come with an obturator, this is sits inside the cannula, the increased rigidity it gives the tube helps with insertion, and it is removed as soon as the tube is in place.

Some tracheostomy tubes have an inflatable cuff surrounding the outer cannula. Use of this type of tube is restricted to where ventilation is to be performed via the tracheostomy and an airtight seal is required, or in a comatose patient where aspiration may be a risk.

Aim for a trachesotomy tube with a diameter of approximately fifty per cent of the diameter of the trachea. Any tube larger than this can cause pressure necrosis and discomfort, also if a larger tube is used and it occludes, then the patient may not be able to breathe around the tube. The tube should extend 7 or 8 tracheal rings from the tracheostomy site distally.

Cleaning the surgical site of a temporary tracheostomy.

Temporary Trachesotomy Technique
Equipment:
Laryngoscope
Endotracheal tubes
Surgical kit
Selection tracheostomy tubes

Suture material (stay sutures, and skin sutures)

Gelpi retractors

General anaesthesia is induced and the animal intubated if possible. The patient is placed in dorsal recumbancy with the forelimbs pulsed caudally. Extend the neck by placing a sandbag or foam wedge beneath the neck. If time allows then the ventral neck is thoroughly clipped and aseptically prepared. A selection of tracheostomy tube sizes should be available; so that a tube that is approximately 50% of the diameter of the trachea can be selected.

The area is draped, and the surgeon makes a midline skin incision in the ventral neck, starting at the cricoid cartilage and running caudally for approximately 5cm. The sternohyoid muscles are separated in the midline to expose the trachea lying directly below them. Self retaining retractors such as Gelpis can be used to maintain retraction. The tracheotomy incision site is usually between the third and fourth, or fourth and fifth tracheal rings. Stay sutures are placed around the tracheal rings each side of the site, and then the annular ligament is incised, being careful that the incision does not extend beyond 50 per cent of the circumference of the trachea. An appropriately sized tracheostomy tube is then gently inserted into the tracheal incision, this is often aided by gentle traction on the distal stay suture. The tube is then secured in place with umbilical tape passed through each side of the neck plate and secured around the patient’s neck. Subcutaneous tissues and skin can then be apposed from each end of the incision.

Post operative management

There is a great deal of post operative care and intensive nursing required following the placement of a tracheostomy tube, even if the tube is to be in place for a short while. These patients need constant round-the-clock supervision: if the tube occludes the patient is left with no patent airway, with obvious results. If facilities do not exist for this level of care, then following insertion of the tube and stabilization, the patient should be transported to a facility where these facilities exist.

Post operative care begins immediately on recovery, where it is useful to use a pulse oximeter or a capnograph to make sure the animal is capable of maintaining adequate ventilation once oxygen supplementation is stopped.

Routine management of the tube includes regular cleaning and suctioning, as well as humidification of inhaled air.

The risk of dislodgement or occlusion of the tracheostomy tube is always present and can have fatal results. Dislodgement can be avoided by correct placement, suitable neck ties and preventing patient interference.
OCCLUSION:

Occlusion is the more common risk, usually due to the tube becoming blocked with blood, mucous and exudate. Mucous production is a problem with tracheostomy tubes due to two factors:

Firstly the presence of the tube in the trachea produces a foreign body inflammatory response, the trachea lining becomes inflamed and secretion increases.

Secondly, in the normal animal the upper respiratory tract has the function of both warming and humidifying the air that is inhaled before it reaches the trachea. With a tracheostomy tube in place, cold, dry air enters the trachea. This can cause dessication of the tracheal mucosa, and production of mucous is increased and more viscous.

To prevent occlusion by this increased production of viscous mucous, regular cleaning and suction of the tube may be necessary. Mucous production and risk of occlusion will be greatest shortly after insertion of the tube, the tube may need cleaning as often as every 30 minutes. After the initial period, the frequency of cleaning should be gauged by observation. Cats and small dogs often require more frequent tube cleaning than larger dogs. The longer the tube is in place, the less the volume of secretion produced, but even at this stage cleaning should be a minimum of 4 times a day.

Suctioning of the tracheostomy tube can be used to remove excess secretions but it is very important to appreciate this is not a benign process and carries risks. This is where the main risk lies, as by introducing negative pressure to the trachea, you are effectively removing air from the lungs, this can lead to hypoxia and collapse of alveoli. To minimize the risk of hypoxia, the patient should be pre-oxygenated immediately beforehand for at least 10 breaths, and the suctioning be kept to a maximum of 15 seconds.

The other risk during suctioning is trauma to the tracheal wall from rigid catheters, or from excessive suction.

To minimize both these risks, the following protocol is suggested.

a) A suitable catheter is selected, being soft, pliable and sterile. Dog urinary catheters are often used but these are too rigid, a silicone feeding tube or a purpose made tracheal suction catheter is more appropriate. Pre-oxygenate the patient for at least 10 breaths.

b) Using aseptic technique, the inner cannula of the tube is removed and cleaned. Sterile saline is introduced to the trachea via the tracheostomy outer cannula. Usually between 1 and 5mls of saline is used depending on the patients size.
c) The catheter is introduced to the level of the carina, and only then is light suction applied as the catheter is removed. As the catheter is withdrawn it is rotated to avoid trauma from excessive suction in one area.

d) Ensure that suction is not applied for longer than 15 seconds. If further suction is necessary, allow the animal a short while to recover, then pre-oxygenate and repeat the process.

e) Re-insert the cleaned inner cannula.

f) Ensure the tube is secure.

If cleaning and suction do not improve and increase in respiratory noise or effort, then the whole tube should be changed. Again the patient should be pre-oxygenated, and preparations be made to intubate if necessary. Using the stay sutures in the trachea, the old tube can be removed and a new one inserted.

**Other Post-Operative Considerations.**

Ideally, to compensate for the loss of humidity from the upper airway, inspired air should be humidified, but in practice this is very difficult. A compromise is to allow the patient to have periods where nubulized air is inhaled. More practical is instilling sterile saline via the tracheostomy tube to try and help prevent the build up of thick viscous secretions. It was previously thought that this saline broke up or dissolved these secretions, but as mucous is 99% bound by di-sulphide bonds then the introduction of saline will not make the mucous any less tenacious. It is thought that the main benefit of the saline is probably in inducing a transient cough that loosens and moves the secretions from lower down the airway.

Aseptic technique is essential during any cleaning, suctioning and general care of the tube and stoma site. Sterile gloves should always be worn, and a new sterile catheter used each time the tube is suctioned. The wound should be inspected and cleaned daily with sterile saline and sterile swabs. Use any antiseptic solutions with caution, as if they are inhaled via the tube they can be very irritant to the respiratory mucosa. Antibiotics should not be used as a substitute for these precautions. These patients are often debilitated and hospitalized for long periods so infection is a serious risk. Tracheostomy sites have been associated with MRSA infections in some studies.

Regular coupage of the patients chest can help with dislodgement of secretions, but be careful that if coughing is induced that the tube does not become dislodged. Check the tube carefully before and after any coupage.
Complications

Consider the animal’s surroundings. As the patient no longer has an upper airway filtering out foreign bodies, so that hair or fluff from bedding can be inhaled into the tracheostomy site. Avoid cat litter or sawdust, shredded paper is safer. Be aware that excessive bedding can occlude the tube when the animal is lying down. In obese or loose skinned patients, skin folds on the neck can also occlude the tube when the patient adopts certain positions.

In some patients the presence of the tube can cause gagging and vomiting but this is rare. Pressure necrosis of the trachea can lead to stenosis or fistula formation. It is important that if a cuffed tube is used, it is deflated, repositioned and then re-inflate every 2 hours to prevent prolonged pressure in one area.

Timing of Tube Removal

The tracheostomy tube is usually removed once the upper respiratory obstruction has been treated and resolved. To assess if a patient is capable of coping without the tube, it can be temporarily occluded using a gloved finger. As the tube selected is never more than 50% of the tracheal diameter, this allows space to breath around the tube, and so ability to ventilate via the upper airway can be assessed. Removal is routine and performed with the animal conscious. Neither tracheal or skin incision is sutured, they are left to heal be secondary intention. This avoids build up of subcutaneous emphysema from air leaking from the tracheal incision and sitting beneath the sutured skin.