Canine and feline intubation tips and tricks

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Orotracheal intubation of canine and feline patients occurs in veterinary clinics every day. Despite this, it can be daunting if you are still mastering this skill or are presented with a difficult airway. Orotracheal intubation is a skill that can be mastered and performed by veterinary nurses/technicians and can be a life-saving procedure in an emergency. The procedure of orotracheal intubation is the placement of an endotracheal tube (ETT) via the patient's mouth into the trachea to establish a secure patent airway for the administration of gases, including oxygen and volatile agents (isoflurane/sevoflurane), and facilitate the administration of positive pressure ventilation.

Selecting an appropriate ETT is an important part of the intubation procedure. The ETT should be the largest diameter that can be placed without resistance into the patient's trachea. An ETT that is too large can cause trauma or irritation to the trachea. A smaller ETT may not effectively seal the airway, which does not protect the patient's airway, could allow volatile agents into the environment, and make mechanical/manual ventilation less effective. An ETT with a much smaller diameter than the patient's trachea will increase airflow resistance, increasing respiratory workload. Also, the smaller the diameter of the ETT, the higher the risk of an obstruction of the ETT occurring from mucous, etc. Whilst there are some weight-based guides for ETT size selection available due to the large variety of canine breeds, these may not always be helpful when selecting an ETT size for your patient, particularly for brachycephalic breeds, as they often have much narrower tracheas than their weight would suggest or patients with extremely high or low body condition scores, as the trachea size doesn't change with a loss or gain of condition. It is this author's preference to select a minimum of three different-sized ETTs for each patient when preparing for orotracheal intubation and, in the case of brachycephalic patients (or patients with a known airway obstruction/inflammation), to select five different-sized ETTs including a much smaller ETT that can be used to secure the airway quickly if the patient begins to desaturate and become hypoxemic. Commonly used techniques for selecting an appropriate range of ETTs include external palpation of the trachea and measuring the width of the nasal septum. However, studies have shown these methods are not successful in predicting ETT size (Tong and Pang 2019). Recording the size of the ETT placed in a patient's record is a useful resource for future intubations.

ETTs come as cuffed or uncuffed; generally, cuffed ETTs are used for anaesthetic procedures as a better seal can be created by inflating the cuff appropriately. Uncuffed ETTs are available in smaller sizes than cuffed ETTs and may be helpful when intubating smaller paediatric and neonatal patients. When an uncuffed ETT is used, a larger diameter tube is required to create an adequate seal. Cuffed ETTs are available as high volume low pressure (HVLP) or high pressure low volume (HPLV). When fully deflated, the cuffs on HPLV tubes will have a lower profile. In contrast, HVLP cuffs will protrude and can make visualisation of the patient's airway more challenging, particularly in smaller patients. HVLP ETT cuffs, however, are at higher risk for tracheal wall trauma as they exert pressure over a smaller surface area. The length of the ETT is also an important consideration. The ETT should measure from the patient's canines to the thoracic inlet or the point of the scapula. ETTs that are too long will increase the dead space in the anaesthetic circuit setup, which can lead to carbon dioxide rebreathing. They are also more likely to be advanced too far into the trachea, resulting in endobronchial intubation. When this occurs, oxygen and anaesthetic gas are not delivered to the non-intubated lung. A too-short ETT will not sit sufficiently into the trachea and can lead to inadvertent extubation. ETTs should be cut to the appropriate length from the circuit adapter end, and the circuit adapter should be reinserted before intubation. ETTs cannot be cut shorter than the insertion of the cuff inflation pilot balloon, as damage to the line or insertion site will result in the cuff not being able to be inflated/deflated properly.

Hypoxemia can quickly develop during the induction of anaesthesia when a patient becomes apnoeic. This is often recognised when the patient's mucous membranes become cyanotic or by getting a reading of less than 90% on a pulse oximeter.

Providing patients with oxygen before the induction of anaesthesia will increase the oxygen reserves in the body by increasing the fraction of oxygen in the alveoli and increasing the time before desaturation and hypoxemia occur during a period of apnoea. It has been shown that providing 100% oxygen via a fitted face mask for three minutes before the induction of anaesthesia can significantly increase the time before desaturation occurs (McNally *et al.* 2009). Delaying the onset of hypoxaemia increases your safety window to successfully intubate your patient and administer positive pressure ventilation if required. Pre-oxygenation by face mask is not always tolerated, and inducing stress can result in higher oxygen requirements and less effective pre-oxygenation. Administering premedication agents before pre-oxygenation can improve patient compliance, or an oxygen cage can be used where the patient doesn't need to be manually restrained. All patients benefit from pre-oxygenation before anaesthetic induction. However, it is especially important in patients where intubation may be difficult or for compromised patients who have less reserves and may desaturate faster or struggle to recover from a hypoxemic event.

Equipment for orotracheal intubation:
- Sufficient anaesthetic induction agent.
- A range of appropriately sized ETTs.
- Laryngoscope with a range of blade sizes.
- Tie to secure ETT.
- Syringe or manometer syringe to inflate ETT cuff.
- Sterile lubricant.
- Oxygen source with appropriate patient circuit/connection.
- Local anaesthetic (for cats).
- Swabs / gauze.

Additional equipment for difficult or high-risk intubations:
- Suction equipment.
- Stylet for ETT.
- Airway exchange catheter.
- Additional assistants.

ETTs should be checked before use to ensure cuffs inflate and deflate correctly without leaks and are clean and clear of obstruction.

The intubation process:
1. Pre-oxygenate patient for a minimum of three minutes using a fitted oxygen mask.
2. Measure ETT and cut to the appropriate length.
3. Ensure the patient is adequately anaesthetised. Otherwise, they may cough, swallow, or bite, making intubation difficult or dangerous.
4. Have an assistant present the patient for intubation. Intubating in sternal is preferred, however, intubating in lateral is possible when more experienced.
    a. Have an assistant lift the patient's head holding behind the canine teeth if needed for larger patients they can scruff the patient with their other hand to help lift the head. A tube tie can also be used to help hold the top jaw and can improve visualisation by removing the assistant's hands from the field.
    b. Don't let your assistant place a hand under the patient's neck to support the weight of the head, as this can obstruct your view and inadvertently obstruct the airway. In the case of some larger patients, two assistants may be required to hold the weight of the patient's head.
5. Use the laryngoscope or ETT to flick the patient's tongue out of their mouth, then pull the tongue out of the mouth and down to help visualise the back of the throat. You can use a swab on the tongue to improve grip if excessive saliva is present. Don't put your fingers inside the patient's mouth!
6. Place your laryngoscope on the back of the tongue and use an ETT to move the soft palate out of the way to visualise the trachea. For feline patients, apply local anaesthetic to the vocal folds / arytenoid cartilages, provide oxygen, and wait for at least 45 seconds.

7. After visualising the tracheal opening, select an appropriately sized ETT for your patient.
8. Place sterile lubricant onto the cuff of the ETT
9. Visualise the trachea again and insert your ETT. For cats, you will need to wait until the vocal folds open; don't try to force through them, as this can cause trauma.
10. Securely tie the ETT in place.
11. Assess that your ETT has successfully passed into the trachea by looking where the ETT is inserted, watching for condensation in the ETT with each breath, feeling the breath come from the ETT or using capnography.
12. Connect the patient to the breathing circuit and start oxygen.
13. Inflate the ETT cuff.
14. Turn on the volatile agent if it is to be used.

Correct inflation of the ETT cuff is important for creating an effective seal of the airway; excessive inflation can cause tracheal trauma or rupture and, in extreme cases, can be fatal. Cuff inflation techniques commonly used include minimum occlusive volume (MOV) or using a manometer syringe device. The ideal ETT cuff pressure when using HVLP ETTs is 20–30mmHg. Using a manometer syringe connected to the pilot balloon, the ETT cuff can be inflated to within this pressure range with good accuracy and minimal training. The limitation of this technique is generally the cost of purchasing the manometer syringes. The manometer syringe is also not effective for use with HPLV ETTs. The MOV technique involves inflating the ETT cuff whilst administering a positive pressure breath until no audible air leakage is heard at a pressure of 15–30cmH_2O. This technique does not require special equipment other than the anaesthetic machine/circuit, however, it does rely heavily on the skill of those performing the procedure and so has a higher margin for error. The MOV technique is effective for use with HPLV ETTs. It is recommended to recheck ETT cuff pressure throughout the anaesthetic as the patient becomes more relaxed the seal may be lost, and further inflation may be required (Hung, *et al.* 2020).

Lubrication of the cuff of the ETT with a sterile water-soluble lubricant has been shown to create a better seal when HVLP ETT are used and protect the patient from aspiration of fluid around the ETT cuff. Lubricant must not be placed inside the ETT or covering the end or Murphy eye openings as this could result in a life-threatening obstruction of the ETT (Blunt *et al.* 2001).

Applying lidocaine to the arytenoid cartilages, particularly in feline patients, reduces laryngospasms and can help facilitate tracheal intubation. Following the application of lidocaine a minimum of 45 seconds should be waited before attempting intubation (Jones *et al.* 2021).

Using a stylet or airway exchange catheter can be helpful when faced with a difficult intubation such as a neonate, brachycephalic or a patient with an upper airway obstruction. An airway exchange catheter is a smaller tube that may be easier to visualise passing into the patient's airway and allows the administration of oxygen. It can then be used as a guide catheter for passing an ETT over and into the trachea. Practicing using these devices in non-emergent situations is a good way to upskill and be able to use these devices effectively in an emergency.

References

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