Small animal anaesthesia and the role of the nurse: part one

Author: Fiona Scarlett

Categories: RVNs

Date: September 1, 2011

Fiona Scarlett, BSc(Hons)(AnSc), RVN, focuses on the benefits of preparation when performing endotracheal intubation techniques

THE aim of these articles is to discuss the role of veterinary nurses and the regulations in relation to anaesthesia, especially regarding advanced anaesthetic techniques. I will concentrate on cats and dogs and will limit the techniques discussed in the two parts to:

• endotracheal intubation – advanced concepts/techniques;

• various uses of local anaesthesia;

• total intravenous anaesthesia (TIVA), partial intravenous anaesthesia (PIVA) and constant-rate infusion (CRI); and

• alternative vascular catheterisation.

Legislation

Regulations set out in the Veterinary Surgeons Act 1966 and the RCVS Guide to Professional Conduct offer guidelines for veterinary surgeons; VNs and SVNsa also work under the VSA as their actions are always under veterinary direction. There is an RCVS Guide to Professional Conduct for Veterinary Nurses, which may be downloaded from the RCVS website.

Throughout this article, when referring to VNs and SVNsa, the definition of each is as follows.
• VNs are those whose names are entered in the list maintained by the RCVS. Listed veterinary nurses include registered veterinary nurses for this purpose.

• An SVN is someone enrolled with the RCVS for the purpose of training as a veterinary nurse at an approved training and assessment centre, or a veterinary practice approved by such a centre.

**Schedule 3**

Schedule 3 is an amendment to the VSA permitting VNs and SVNs (under direct veterinary supervision) to provide medical treatment and perform minor surgery not involving entry into a body cavity. Like members of the public, VNs and SVNs can also administer first aid in an emergency until assistance from a veterinary surgeon is possible. Schedule 3 does not define specific procedures that may be undertaken, which, in my view, results in “grey areas” in what is acceptable for VNs and SVNs to perform. It does, however, highlight areas that the veterinary surgeon must consider, including:

• how difficult the procedure is in light of any associated risks;

• whether the nurse in question is qualified to treat the species concerned and understands the associated risks;

• whether the nurse has the necessary experience and good sense to react appropriately if any problems should arise;

• whether he or she is satisfied that the nurse feels capable of performing the procedure competently and successfully; and

• whether he or she is available to answer a call for assistance.

A VN should be happy to meet the criteria listed above, taking into account training and experience.

**Anaesthesia**

Separate advice is available on the maintenance and monitoring of anaesthesia, and includes the following.

• Inducing anaesthesia by administrating a specific quantity of a medicine directed by a veterinary surgeon may be performed by a veterinary nurse or, with supervision, a student veterinary nurse.

• Administering medicines incrementally or to effect, to induce and maintain anaesthesia, may only be performed by a veterinary surgeon.
• Maintaining anaesthesia is the responsibility of a veterinary surgeon, but a suitably trained person may assist by acting as the veterinary surgeon’s hands (to provide assistance that does not involve practising veterinary surgery) – for example, by moving dials.

• Monitoring a patient during anaesthesia and the recovery period is the responsibility of the veterinary surgeon, but may be carried out on his or her behalf by a suitably trained person.

• The most suitable person to assist a veterinary surgeon to monitor and maintain anaesthesia is a veterinary nurse or, under supervision, a student veterinary nurse.

**Advanced techniques and associated monitoring**

Advanced techniques usually require a level of understanding and training as to:

• why a certain technique would be preferable over another;

• what the goal of a given technique is; and

• the implications for the patient.

Some of these advanced techniques will come from training to become a VN, and some will be more theory followed by practice. Others won’t develop until you are working in a specialist environment that regularly performs the techniques.

**Endotracheal intubation**

Endotracheal intubation is the definitive method of airway management and is a required skill for SVN training. VNs and SVNJs need to be familiar with various methods to maintain a patient’s airway, whether as part of anaesthetic management or in an emergency. Successful and safe endotracheal intubation requires careful preparation, excellent technique and watchfulness for potential complications. Certain techniques should not be taken for granted. For every intubation we carry out, the following process is followed.

• Pre-measure the endotracheal tube (ETT) against the patient. The tube length should be measured from the incisors to the thoracic inlet. Alternatively, the ETT can be cut to the correct length once the patient has been intubated (Figure 1).

• Inflate the cuffs on the ETTs to ensure there are no leaks (Figure 2). Keep the cuffs inflated while you prepare for induction to ensure no slow leaks are present.

• Ensure that the ETT is clean and patent.
Refer to Table 1 and Figure 3 for the normal technique for endotracheal intubation in cats and dogs.

To ensure the ETT is placed correctly, several methods can be used to determine its location, as listed below.

- Direct visualisation of the tube in the larynx using a laryngoscope.
- Simultaneous movement of the breathing bag and the patient’s chest.
- Capnography is tremendously helpful – a capnogram and/or an end-tidal carbon dioxide reading ensure correct placement.
- Bilateral lung sounds, detected by auscultation of the chest when the lungs of the patient are being ventilated.

Visualisation of condensation on intubation does not necessarily confirm correct placement, as a vapour trail can be caused by megaoesophagus/distended stomach due to aerophagia. Inappropriate endotracheal intubation technique may result in iatrogenic upper airway trauma (Table 2). During anaesthesia induction, many events occur in rapid succession. It is very important all equipment required for endotracheal intubation is gathered, checked and organised. By understanding the principles of airway management, VNs and SVN are ideally placed to do this.

For advanced intubation techniques, the following points should be noted.

- Pre-oxygenation. This is important whenever a delayed or prolonged intubation is expected. The goal of preoxygenation is to increase the percentage of oxygen in the functional residual capacity (FRC), which is the volume left in the lungs at the end of normal expiration. By increasing the oxygen concentration in the FRC, it is possible to prolong the time taken before hypoxia may occur (due to hypoventilation or apnoea). This may be three to four minutes compared to 90 seconds, when proper pre-oxygenation is done for at least five minutes. Pre-oxygenation can be achieved with a flow-by method (Figure 5) or a mask.

- Good light source (such as a laryngoscope). This allows for direct visualisation of the laryngeal landmarks. In some breeds, such as brachycephalics, the laryngoscope blade can help to move excess tissues to the side, as well as illuminate the oropharynx. By using a laryngoscope with every endotracheal intubation, operators’ skills will not degrade, which will guarantee ease of use in patients requiring more advanced intubation techniques. Examples of endotracheal intubations requiring further skills and considerations include patients with fragile eyes or raised intraocular pressure (IOP) or intracranial pressure (ICP); neck pain or an unstable spine; myopathy, such as masticatory myositis; upper airway obstruction; and excessive oral secretions/emesis/regurgitation risk.
These cases may require rapid intubation and/or precautionary measures, as intubation may be delayed or difficult. In some instances, intubation is only possible in a limited position or with minimal or no view of the oropharynx.

**Fragile eyes, IOP and ICP**

These cases may include ocular foreign body; deep corneal ulcer; glaucoma; head trauma; and brain tumour/space-occupying lesions in the brain. Coughing and/or gagging will cause increases in IOP and ICP. For a fragile eye this could increase the chances of the globe rupturing. In neurology patients, these reflexes will cause a profound increase in ICP and may exacerbate clinical signs – even proving fatal. The use of drugs that may induce vomiting, such as alpha-2 agonists or morphine, should be avoided. Smooth intubation and extubation are crucial. It is vital to ensure these patients do not swallow when the tongue is grasped, cough or gag during endotracheal intubation, or cough or gag on extubation – extubate these patients slightly earlier. The application of a local anaesthetic agent in the arytenoids is essential in cats, but may also be considered in dogs. Otherwise-healthy patients with ocular disease often benefit from a moderate to profound sedation to help minimise the restraint required for intravenous catheter placement and/or induction of anaesthesia. A good sedation will also provide a good background for the induction of anaesthesia as it contributes to suppression of reflexes to aid a smooth intubation.

**Neck pain and cervical spine trauma**

Examples of neck pain and cervical spine trauma include atlantoaxial (AA) subluxation, neck trauma and cervical disc extrusion. Patients with AA subluxation do not tolerate any neck flexion or extension, as either may exacerbate the subluxation and result in irreversible damage to the spinal cord.

A neutral head position needs to be maintained during the entire anaesthetic period. To maintain a neutral neck and spine position for intubation, the animal is put into lateral recumbency as the induction agent takes effect. Having several people to hand at this stage is important. The lower jaw can then be opened to allow for endotracheal intubation (Figure 6).

**Myopathy (such as masticatory myositis)**

Endotracheal intubation in a patient with this myopathy can be very challenging. Jaw mobility may be so limited that visualisation of the oropharynx can be very difficult or even impossible. Intubation may have to be done blindly.

Once these patients have a secure airway they don’t often cause ongoing challenges to the anaesthetist. Monitoring would be the same as for any other anaesthetised patient.

**Upper airway obstructions**
Examples of upper airway obstructions include:

- brachycephalic obstructive airway syndrome (BOAS);
- laryngeal paralysis/collapse; and
- oropharyngeal mass/haematoma/swellings.

Brachycephalic breeds often have hypoplastic tracheas. Selected ETTs are often smaller than appreciated for the size of the patient. It is recommended to have:

- an assortment of ETTs of various sizes (Figure 7);
- a stylet; and
- extra swabs and oral stick swabs.

Brachycephalic breeds should ideally have a late extubation. Extubation should take place once the patient does not tolerate the tube any more (such as when chewing, coughing and pawing at the mouth).

Some dogs will tolerate the tube in situ for a long time once they have recovered and are swallowing (Figure 8). An experienced nurse should monitor these patients during recovery. Keep the ETT cuff inflated until the swallowing reflex has returned and the throat has been checked with a light source, and cleaned if needed.

The cuff can be left partially inflated during extubation to bring up material that may have entered the proximal trachea. An extra pair of hands is ideal in case the partially deflated cuff is too large to pass through the larynx.

Extra equipment required for recovery includes:

- means to provide extra oxygen;
- suction unit with tubing on standby;
- tray of equipment in case re-intubation is needed if respiratory distress occurs after extubation;
- tracheotomy kit is also advisable in certain patients; and
- a pulse oximeter.
Excessive oral secretions/emesis/regurgitation risk

Examples of excessive oral secretions/emesis/regurgitation risks include megaoesophagus, myasthenia gravis and caesarean sections. These patients need to be kept in sternal recumbency with an elevated head during the anaesthetic induction phase. They must remain in this position until an ETT has been passed into the trachea, secured and the cuff inflated. It is possible to use cricoid pressure in these patients to minimise the risk of regurgitation. This involves applying digital pressure to the cricoid cartilage and pushing it backwards, thereby occluding the oesophagus. Cricoid pressure is maintained until a secure airway is achieved. Other equipment includes:

- a good light source;

- swabs and oral stick swabs to help remove secretions and to clean far back into the oropharynx if necessary (Figure 9);

- suction unit with tubing on standby;

- a rigid urinary catheter to fit on the end of the suction unit in case lavage of the oesophagus is needed; and

- tap water/saline, and a large syringe for oesophageal lavage.

Aside from anaesthetic monitoring, other tasks include regularly checking the larynx and oropharynx with a good light source (Figure 10). Check for any fluid build-up and take necessary action to remove this. This is especially important when procedures are complete and the patient is being woken. It is advisable to have the patient placed back into sternal recumbency to maintain the head in a raised position. In dogs a partially inflated cuff (remove some but not all the air) may be used to help pull any fluid up and out of the trachea at the point of extubation. If regurgitation does occur, the following measures may be taken:

- ensure the ETT is cuffed appropriately;

- tilt the head down, either by tilting the table, supporting the patient’s head carefully off the table, or by placing a rolled towel underneath the head to elevate the neck, but tilt the nose and mouth down (Figure 11). Reflux is the most common cause of oesophagitis in dogs and cats. Severe oesophagitis that extends into the deeper layers of the oesophagus may result in stricture formation. Oesophageal suctioning alone does not significantly alter the pH of the fluid present. It is, therefore, important to lavage the oesophagus and neutralise the pH of the fluid in it. Regurgitation or reflux can originate from the stomach and/or the duodenum. Fluid from the stomach will have a very low pH (acidic), while fluid from the duodenum has a high pH (alkaline). Both will contain digestive enzymes, such as pepsin, bile and proteolytic pancreatic enzymes, which, together with the extremes in pH alterations, will cause mucosal damage in as little as 20
minutes of contact time. Lavaging with warm tap water increases the pH significantly, but only for between 90 seconds and 20 minutes. Therefore, physiologic saline may be a good alternative.

The technique for oesophageal lavaging is as follows.

- Visualise introduction of the urinary catheter into the oesophagus.

- Standard treatment is to lavage the oesophagus with enough saline (or tap water) until the fluid returned is clear. For each fluid bolus introduced, suction will be required to remove it before the next bolus of fluid is introduced. Continue in this alternating manner – flushing and suctioning.

- Deflate the cuff only at extubation, or consider a partially deflated cuff at extubation.

- Watch the head position.

- The veterinary surgeon may consider post-anaesthetic gastric acid-reducing/gastroprotectant medication, such as omeprazole.

Communication between the team is essential for these more challenging cases. The veterinary surgeon can guide and train VNs and SVN under Schedule 3 to foresee potential difficulties in these patients. VNs and SVN are ideally placed to help thoroughly prepare and allocate tasks to minimise stress for the patient and the operator. Pre-oxygenation may allow more time to secure an airway and is always worth doing in these instances. Practising techniques – such as the use of a laryngoscope – will ease the process when it comes to dealing with the trickier endotracheal intubation. Many techniques mentioned can be practised on less-demanding patients to prevent degradation of skills.

- The second part of this article will look at advanced techniques, uses of local anaesthesia, TIVAs/PIVAs/CRIs and alternative vascular catheterisation.

References

Reviewed by Marieke De Vries, CertVA, DipEDVAA, DVM, MRCVS