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Understanding and improving airway management in companion animals – Part 2

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Abstract: This article reviews alternatives to endotracheal tubes for airway management in veterinary patients under anaesthesia. Anaesthesia has had many improvements over the past few decades and now airway management is finally catching up and so veterinary anaesthetists have a wider choice of options. As in other areas of anaesthesia, airway management should not be a one-size-fits-all approach. Patient and procedure should be considered before selecting the most appropriate airway device.

Keywords: Airway management; v-gel® supraglottic airway device; anaesthesia

Introduction

Small animal practice had, until recently, four options available for airway management: face mask, endotracheal tubes, emergency options of tracheotomy tubes and, in some cases, no airway management at all. Recently, a fifth airway management option of the supraglottic airway device (v-gel®, Docsinnovent Ltd) gives the veterinary professional another possibility. Having discussed endotracheal tubes previously, this second part focuses on the other airway management options.

Omission of any airway management

This option is often used for shorter procedures such as cat castrations and is sometimes justified by the known causal association of increased mortality with the use of endotracheal tubes in these feline patients (Brodbelt, 2007; Jolliffe, 2011; McMillan, 2014). However, anaesthesia impairs upper airway integrity (Davison & Cottle, 2010) and, as such, leaves the patient open to dangers such as reflux, regurgitation and associated inhalation pneumonia. Patient positioning can also allow the tongue and food/foreign material (especially in rabbits, which have not been starved) falling onto the glottis. Every surgical procedure should have a secure safe airway device.

Face masks

Face masks are undoubtedly quick and easy to use, which makes them useful for pre-oxygenation, or deepening plane of anaesthesia prior to safe placement of a more permanent airway device. A sealed, appropriately sized device does allow some degree of manual ventilation and capnographic monitoring. Their biggest downfall is perhaps that of atmospheric pollution (Hoerauf et al., 1998), but other problems include increased dead space, patient stress and breath-holding, airway obstructions (tongue, food or occluding nostrils) and higher costs involved with the increased flow rates required: one oxygen mask manufacturers recommendations are cats 1–3 litres O₂, small dogs 3–5 litres O₂, large dogs 5–7 litres O₂ (Surgivet/Smiths Medical, 2018); compare this to 150 ml/kg/min on a Magills or Lack system and 250 ml/kg/min on a Bain or T-piece system (Lyon, 2018). These issues mean that face masks are contraindicated for induction or longer-term maintenance. Where they are used, there are two important considerations for their use:

1. use of a good sealed scavenging mask,
2. patient size/tidal volume versus mask size (given that tidal volume is calculated at 10 ml/kg for dogs/cats and 4–6 ml/kg rabbits) (**Figure 1**).



■ **Figure 1.** Rabbit face mask (permission Amir Maurer, Israel).

Rather than picking up the nearest face mask to hand, care must be taken to select the right size for the patient.

Supraglottic airway devices (SGADs)

Originally developed for human anaesthesia, the only supraglottic airway devices on the market developed for veterinary use are the cat and rabbit v-gel® (Docsinnovent Ltd, **Figure 2**), although devices for other species are being developed. They both appeared on the market in 2012 and have given the veterinary profession another viable option for airway management. SGADs were developed to avoid some of the problems that endotracheal tubes can cause, but have also proven useful for their ease of placement (Barletta, Kleine, & Quandt, 2015), particularly important in rabbits.

The v-gel® has a soft medical silicone bowl shaped into the pharyngeal landscape of the individual species. This bowl completely fills the pharynx, sitting over the glottis, allowing the capture of the patient's breath as it flows through its own natural airway. The seal is sufficient to allow positive pressure ventilation (Prasse, Schrack, Wenger, & Mosing, 2015). The tip of the v-gel® forms an oesophageal seal to prevent regurgitate entering the pharynx or larynx to be aspirated by the patient (**Figure 3**).

Suitable procedures

This SGAD concept allows atraumatic security of the airway and does not increase natural airway resistance. This security does make the v-gel® suitable for a wide range of procedures, including dental examination and treatment, bronchoalveolar lavage and bronchoscopy (**Figure 4**), allowing the continual ventilation of the patient whilst the procedure is carried out.

Their speed of placement even during laryngeal spasm makes them particularly useful for securing an airway in emergency patients, allowing gentle and controlled resuscitation.

There are some procedures where v-gel® cannot be used; for example, the oesophageal seal will not allow the passing of a gastroscope. The positioning of the device will also restrict access to the pharynx, so procedures such as upper airway surgery, nasal flushes and placement of nasogastric feeding tubes are not compatible with v-gel use.

Sizing

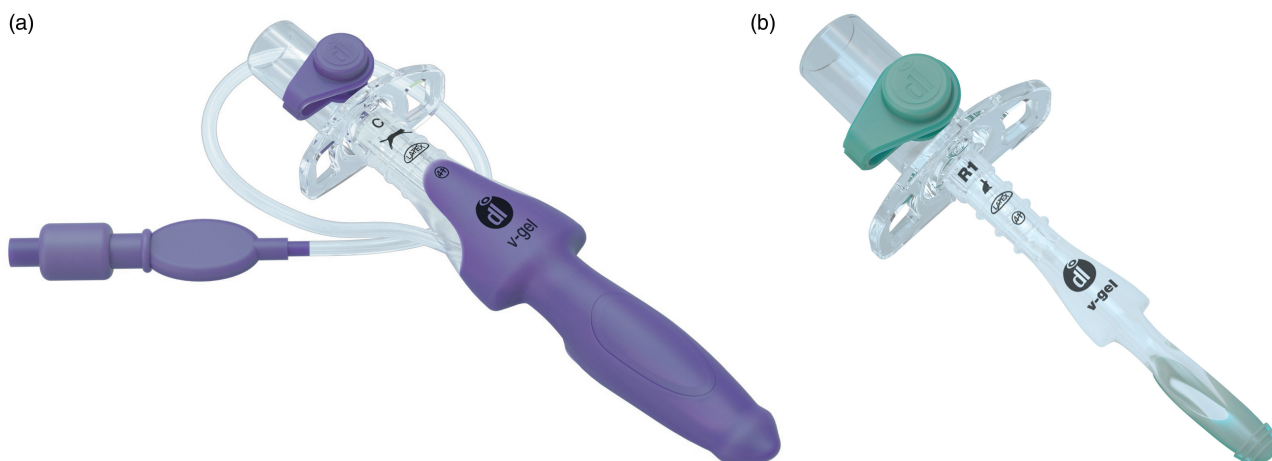
Successful use of the v-gel® requires an ability to select the correct size and confirm accurate placement. The manufacturer's sizing guide, which is based on ideal body weight, is a good starting point; however, care must be taken to follow the same rule with any airway device to take the largest size possible that will fit safely in the patient.

A useful tip for cats is to gauge size based on age, thus:

- 8–12 weeks: C1
- 3–5 months: C2
- 5–6 months and small adults: C3/C4*
- Large adults: C5/C6*

*C4 and C6 are the longer versions of the C3 and C5 devices, respectively. These longer versions allow the device to extend out of the muzzles of the longer-faced breeds such as the Siamese and Norwegian Forest Cat.

With rabbits, again the manufacturer's sizing guide should be the first port



■ **Figure 2.** (a) Cat v-gel® (purple) (Docsinnovent Ltd), (b) Rabbit v-gel® (green) (Docsinnovent Ltd).

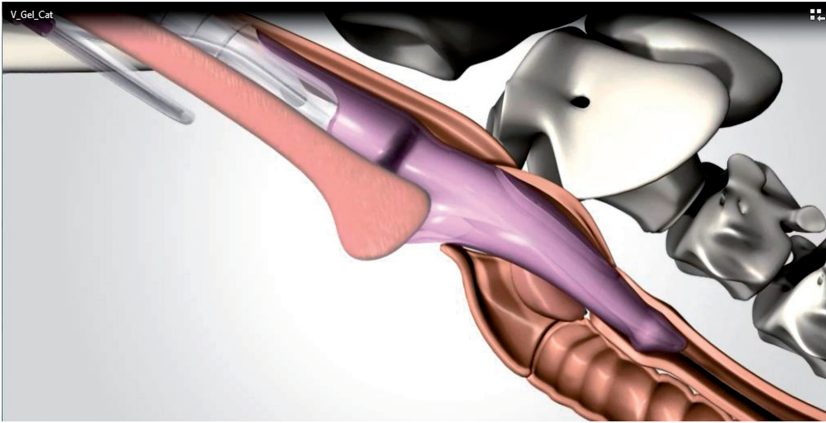


Figure 3. Cat v-gel® placement (Docsinnovent Ltd).

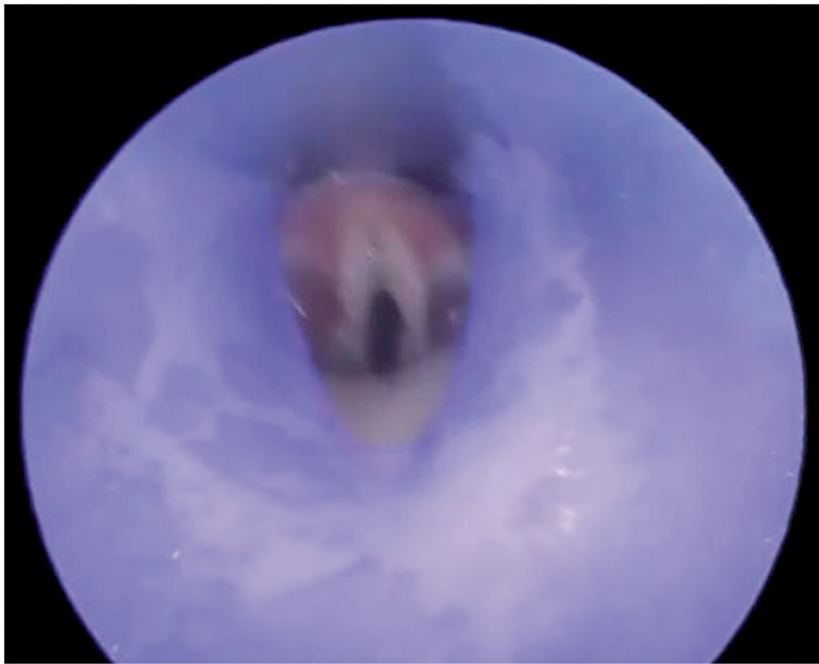


Figure 4. Bronchoscope view inside v-gel® (Docsinnovent Ltd).

of call, selecting the larger of the two sizes where there is an overlap in size ranges. To confirm the correct size has been selected prior to placement, check against the length of the animal's

oropharynx. Place the v-gel® externally alongside the rabbit with the bowl overlying the larynx and the incisors should be level with the rabbit silhouette image on the v-gel® (Figure 5). Training videos



Figure 5. Measuring oropharynx length of v-gel® (Docsinnovent Ltd).

are available on the manufacturer's website to assist new users.

Placement

The v-gel® is lubricated with a water-based lubricant and following pre-operative oxygenation and mouth clearing of the patient, it is advanced into the mouth with the tongue gently pulled forward. The v-gel® is advanced until its shoulders are pushed against the palatoglossal arch at the back of the patients mouth and cannot be advanced any more. The cat device has a dorsal inflatable section which is only required for brachycephalic cats undergoing intermittent positive pressure ventilation, because of the different shape of their pharynx.

Potential pitfalls

Although the v-gel® is easier to place than an endotracheal tube (Barletta, Kleine, & Quandt, 2015), there are still some common mistakes which can be detrimental to the patient, so care must be taken. For example: if the device chosen is too small then movement of the device can be noted as the patient is moved or positioned for surgery, and anaesthesia gases could also be pushed into the stomach on assisted ventilation.

This situation can be identified very easily at the time of initial insertion by the simple rotation of the device by user once placed. If the capnograph port springs back to the dorsal position, then the rotation is only on the neck of the device and not the bowl and correct size selection and placement is confirmed. If the device can be rotated 360° then it is either too small or not fully advanced into the pharynx with the device just sitting on the tongue base. If the v-gel® cannot be advanced further, then it should be immediately removed and replaced for a larger device.

If the device is under-inserted, seated on the base of the tongue, then lingual congestion may be noted as a cyanotic tongue. Pulling the tongue gently forward will often release this pressure, allow blood flow to resume and allow the v-gel® to drop into the pharynx.

Recovery

In the author's opinion, one major advantage for the v-gel® is in the recovery stage. Extubation of a patient with an endotracheal tube can be a traumatic time: due to the device holding the arytenoids open, it must be removed

early in the recovery process as the laryngeal reflexes return to avoid potential trauma. At this stage, the recovering patient has not yet got completed control of the upper airway and so laryngospasms and aspiration of gastric contents are still a concern and studies show the mortality risk at the recovery stages are high (Robertson, 2012). Due to the pharyngeal placement of a SGAD and the lack of airway resistance, the SGAD can be left in place much longer in the recovery process. Human patients have been known to remove the device themselves – videos can be seen on YouTube!

The v-gel® has reached the teaching of veterinary students in over 60 vet schools and colleges globally. Anaesthesia has had many improvements over the past few decades and now airway management is finally catching up: so as an anaesthetist, you now have a wider choice of options:

assess your patient, consider the procedure, and choose the most appropriate airway device.

Disclosure statement

Author works for Docsinnovent Ltd.

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