Anesthesia, Safer with v-gel®

A new airway option for the veterinarian

VIDEO http://bit.ly/NOVAHS2014

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v-gel® devices are anesthesia tubes known as Supraglottic Airway Devices (SGADs). These sit within the pharynx and form a mask like seal, over the larynx and trachea. They then connect at their other end to the anaesthetic circuit via a standard connector. SGADs do not enter the larynx or trachea – this offers the veterinarian a safer way to manage the airway during anesthesia.

Figure 1 - Rabbit v-gel (ventral aspect)

Figure 2 - Cat v-gel (dorsal aspect)

SGADs are routinely used within the field of human anesthesia because they offer a much lower risk of malposition into the oesophagus or bronchi upon insertion and avoid the risk of causing tracheal and laryngeal trauma, causing postoperative throat pain and coughing. Human SGADs are the wrong shape for veterinary anesthesia and are difficult to use reliably in non primate species.

v-gels® (Figures 1 & 2) are SGADs anatomically designed to work effectively for domestic animal species. They are currently available in various sizes for cats and rabbits, with other species on the way. SGADs work by acting as a mask over the laryngeal opening, without touching the larynx or trachea. They have the additional advantage of an oesophageal tip that enters and seals the upper oesophageal to help block oesophageal gastric reflux from entering into the respiratory system. Although v-gels® represent a completely new method of managing the airway during veterinary anesthesia, the concept is simple – it is an airway for delivering gas anesthesia, sealing within the pharynx (Figure 3), rather than within the trachea as is the case with traditional tracheal intubation.

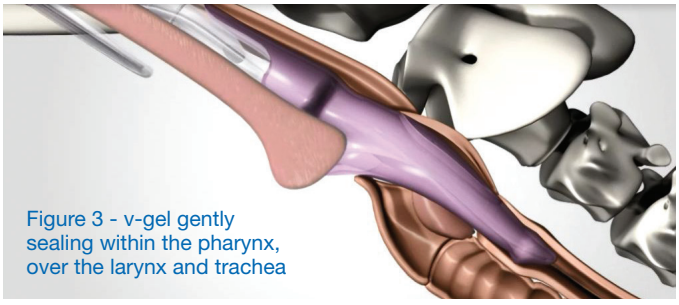

Figure 3 - v-gel gently sealing within the pharynx, over the larynx and trachea

So what are the core advantages that v-gel® offers the veterinarian by sealing in the pharynx?

- Placement of device becomes significantly easier and faster, whilst also avoiding the risk of oesophageal and bronchus malposition.
- By not entering the trachea or larynx, you avoid cilia damage, tracheal necrosis, bleeding, or tracheal perforation and you reduce the risk of laryngospasm, all of which can cause postoperative throat pain or serious illness.
- A safer airway management method for dental procedures.

Faster and easier placement increases safety:

Placement of a v-gel® is reliably faster and easier than the traditional intubation process, in cats (2.5 seconds) and especially in rabbits (8 seconds). This means the veterinarian will gain a much more rapid control of respiration and anesthesia gas delivery for the patient.

v-gels® have been designed so that they flex to self-guide into the correct place. v-gels® will always flex dorsally over the larynx and end up with the sealing tip located into the upper oesophagus and the airway channel open over the laryngeal inlet (Figure 3).

The rapid placement is coupled with protection against accidental malposition (common with traditional airway management methods) into the oesophagus or bronchus.

Avoiding laryngeal and tracheal contact increases safety:

Veterinarians take great care to reduce laryngeal and tracheal trauma when using traditional intubation processes. Severe tracheal trauma can occasionally unfortunately occur in the form of tracheal tears, bruising and necrosis. Another type of tracheal trauma that is inevitable regardless of the type of intubation technique employed is that of tracheal cilia damage.

The tracheal mucosa is constructed from a pseudostratified ciliated columnar epithelium, studded with goblet cells. The tracheal surface is covered by a dense carpet of ciliated cells; several hundred cilia per cell beating at about one hundred times per minute to power a sticky layer of mucus upwards towards the pharynx, eliminating bacteria and foreign particles from the respiratory system (the mucociliary escalator). Therefore tracheal cilia play a vital function in the natural respiratory immune defences. Many peer-reviewed papers exist which prove that traditional intubation methods have the unavoidable effect of ripping the delicate cilia from the epithelial surface.

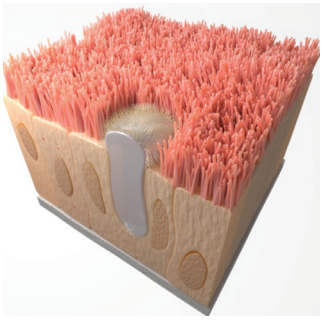

Figure 5 - Undamaged tracheal epithelium

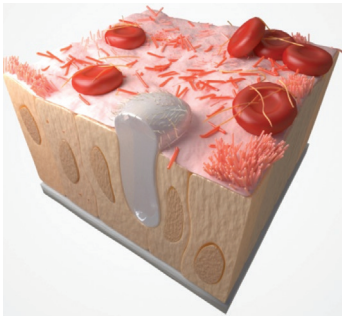

Figure 6 - Tracheal epithelium after intubation

So why does this matter? After damage the mucociliary escalator recovers slowly, and during a week of poor or eliminated immune system function, the patient is exposed to an increased risk of contracting respiratory infections such as bacterial tracheitis and pneumonia, which can be dangerous and in some cases even fatal. Clinical signs of this damage would include throat pain and coughing which could increase patient stress, compromise appetite and also the ability to take oral medication, all of which could contribute towards slowing the patient's recovery rate. Because the v-gel® does not touch the trachea, it will simply never damage the tracheal cilia.

Mechanical trauma is a major cause of laryngeal spasm, especially in cats, during anesthesia where a traditional intubation process is used. v-gel® also avoids contact with the sensitive laryngeal structures and in doing so avoids laryngeal mucosal ischaemia, potential necrosis and any mechanical damage to the arytenoid cartilages.

So why does v-gel® not cause any trauma by sitting in the pharynx? This is because the pharynx is lined with a very tough stratified epithelial layer designed to cope the movement of rough food boluses. The v-gel® is made from super-soft medical silicone that is anatomically shaped to match the shape of the pharynx. This gives a combination of an excellent airway seal with comfort and protection to the pharyngeal tissues.

Increases safety in dentistry:

In one published study, 70% of hospital admissions for iatrogenic tracheal ruptures were associated with dental surgery. These ruptures were almost certainly related to cuff inflation. Again, without touching the trachea, it is impossible for the v-gel® to cause this type of damage.

v-gel® benefits come into force for dental procedures. The fact that they fill the pharynx automatically gives some protection against dental fluid aspiration, but it is always recommended to place surgical gauze swabs proximal to the head of the v-gel® to absorb fluid. The oral portion of the v-gel® can be moved and repositioned within the mouth without displacing the head of the v-gel® from its position over the larynx. As the v-gel® makes no tracheal contact there is no concern about laryngeal or tracheal trauma caused by the unavoidable movements of the tube as the head is repositioned during surgery.

Further safety benefits from using v-gel®

Endotracheal airway management by its nature must narrow the airway as it feeds down into the trachea. Airway resistance increases quickly as diameter reduces – halving the airway diameter results in an increase in airway resistance (or the effort required to breathe) by sixteen times. Obviously, the less a patient has to work in order to ventilate the lungs, the safer that patient is. As the v-gel® forms a seal over the top of the larynx, the airway diameter that the patient has to breathe through can be maintained from the trachea all the way to the circuit, therefore v-gel® is safer.

The tying points on the v-gel® connector and tying grip rings around the tube make it easy and fast to tie v-gels® in place securely, without allowing any slipping or rotation once positioned in the patient.

A high quality seal in the pharynx without the concern of causing trauma means there is greater control of gas delivery to the patient. It also avoids subjecting the veterinarian and technician to the health hazards of leaked anaesthetic gases – doubly important if members of staff might be pregnant.

v-gel® has been designed with protection against cross infection in mind. It achieves this because the materials are suitable for a pre-wash and clean in water and enzymatic cleaning solution followed up, after a thorough drying, by sterilisation in a standard steam autoclave (max 250 F).

When to use a v-gel®

v-gels® are appropriate for various procedures including elective surgeries such as spaying and neutering, routine and emergency abdominal and orthopaedic procedures, head surgeries where extreme neck flexion is required, dental surgery in cats, dental surgery in rabbits (including incisor extraction, spur reduction, extra-oral molar extractions and some intra-oral molar extractions) and emergency procedures where ultra- rapid 'blind insertion' airway management is required. They are now used by many veterinarians around the world and the technique of v-gel® SGAD airway management is now being taught internationally in major veterinary teaching institutions.

Conclusion

v-gels® are a new option for the veterinary practitioner to improve safety during anesthesia. They originate from a long and well established tradition of supraglottic airway devices commonly used in human anesthesia. They offer veterinarians a way to reduce the risk of airway trauma, minimise the time required to ventilate and stabilize a patient and reduce pain and discomfort during the recovery phase of anesthesia. Supraglottic airway management is an effective component in our efforts to move towards ever safer anesthesia.

About the Author Ivan Crotaz BVetMed MRCVS graduated from the Royal Veterinary College in London, UK. He works in UK general small animal and rabbit referral practice. Ivan teaches CPD courses on rabbit medicine, dentistry and anesthesia as well as conducting research and international teaching on airway management in veterinary anesthesia.