Supraglottic mask anaesthesia in rabbits - practical experience

M.Plošková, Animal Clinic, Prague

SUMMARY

Inhalation anaesthesia is now considered to be a gold standard in small mammal medicine. This is a necessary part of the diagnostics and therapeutic treatment. This article describes our experience of using supraglottic airway device for inhalation anaesthesia in rabbits, whose main advantage is a fast and easy introduction and minimal post-anaesthetic complications. This article includes description of two cases, where the supraglottic airway device was used for diagnostics and surgical treatment of the problem located on the head.

Anaesthesia for a small mammal is a much greater risk than dogs and cats (1). The gold standard in is injectable pharmaceuticals with subsequent inhalation anaesthesia. There are several methods to deliver inhalation anaesthesia in rabbits and each technique has its pros and cons, which are often associated with technical design (Tab. 1).

Tab. 1 method of implementation of inhalation anaesthesia, their pros and cons

Guidance Method inhalation anaesthesia		Positives	Negatives
inhalation mask		easy to use	it is not possible to monitor respiratory function and control ventilation, the risk of hypercapnia
			the rate of introduction
Laryngeal Mask Supra-glottic mask		easy to place, monitoring and controlled ventilation	risk of airway obstruction when changing the position of the mask
orotracheal intubation	under the direct control of the endoscope	minimization of traumatization of soft tissues in the implementation, monitoring and control capabilities ventilation	intensive technical equipment
	without visualization of glottis ("blind" technique)	the possibility of monitoring and mechanical ventilation	risk of traumatization of soft tissue, the risk of the cannula into the oesophagus, unsuitable for smaller patients under 2 kg
	Direct visualization of the glottis using a laryngoscope	lower outlay for equipment monitoring and control capabilities ventilation	Worse visualization during the deployment, the risk of traumatization of soft tissues
nasal catheter		acute patients during surgery or head rhinotomy	small diameter catheter requires a higher concentration of inhaled gas
tracheal intubation in tracheotomy		acute patients, patients with extensive surgery in the oral cavity	the risk of stricture after closing the trachea

With regard to the anatomy (the length and shape of the oral cavity, the length of the soft palate) intubation in rabbits is not as easy as in the case of a dog or cat. To visualize the glottis during intubation requires the use of an

endoscope, which is not standard equipment in every medical practice. Glottis and soft tissue in the vicinity are sensitive to trauma, which easily occurs when swelling with a possible obstruction of the airways. The most common used method, mask inhalation, brings difficulties taking control of the respiratory function during extended use at risk of hypercapnia and hypoxia. (2.3)

Poor techniques and resulting complications of endotracheal intubation are presented as one of the factors increasing mortality associated with anaesthesia in small mammals. (4) To minimize this risk we visualization of glottis in the implementation of intubation. (5) If the endotracheal tube is inserted "blindly" this increases the risk of introduction of the endotracheal tube into the oesophagus. In addition, intubation complications may occur immediately afterwards with direct trauma and subsequent tracheal stricture complications associated with dyspnoea up to 2-3 weeks after the treatment itself. (5)

Supraglottic laryngeal and masks have been used in human medicine for airway management for a long time, mainly where it is not possible introduction of an endotracheal tube and in acute medicine. (6,7,8.) In the past, veterinary medicine has attempted to use human paediatric laryngeal mask. v-gel (v-gel ®, Docsinnovent, UK) is a new supraglottic mask made specifically for the needs of animal patients, currently for rabbits and cats. Devices are made of durable material and they are designed for re-use following sterilisation in an autoclave. They are produced in six sizes, depending on the patient weight (Fig. 1).

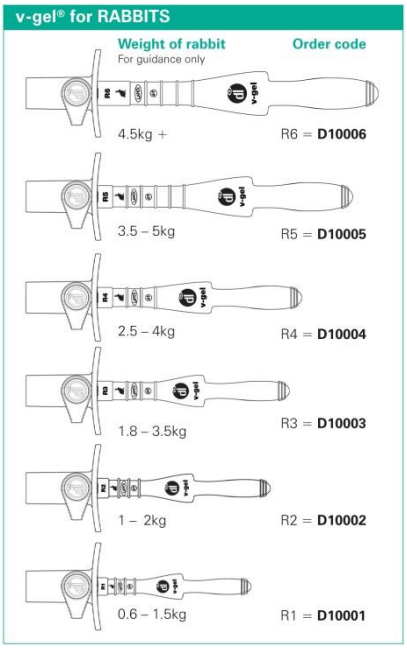

Fig.1 supraglottic mask in gel ® (source: www.docsinnovent.com)

PRACTICAL EXPERIENCE

Supraglottic mask (v-gel ®, Docsinnovent, UK) have been used in our department for inhalation ansesthesia in rabbits since the spring of 2014. They are used for most diagnostic and surgical procedures that are performed using inhalation anaesthesia. Size 1-3 are the most common sizes used for our rabbit patients.

For non-surgical diagnostics, (ultrasound, X-ray or CT scan) anaesthesia protocols are: premedication patients butorphanol (0.2 mg / kg, IV, IM) in combination with midazolam (0.2 mg / kg, IV, IM) prior to inhalation agents.

For patients who are pre-medicated prior to surgery, it is the combination of butorphanol (0.2 mg / kg, IV, IM), midazolam (0.2 mg / kg, IV, IM), medetomidine (0.01 mg / kg, IV, IM) and ketamine (3-5 mg / kg, IV, IM. Anaesthesia was induced by intravenous administration of Propofol (3-6 mg / kg IV) or a short inhalation of isoflurane via face mask) before introducing supraglottic mask was attempted.

Placement of v-gel

Lubrication of the v-gel is required. We applied local anaesthetic gel or spray (mesocain, lidocaine). The manufacturer recommends also local anaesthetic directly in the nasopharynx, but our experience showed only application on the v-gel itself was sufficient and better controlled. Sternal position for introducing the v-gel was most ideal and provides the best control, but if necessary it is possible to introduce v-gel also in a lateral position.. It is always necessary to check the mouth to avoid the possibility of pushing food particles into the respiratory tract and the subsequent development of aspiration pneumonia. After pulling the tongue forward, it is possible for the v-gel to be inserted freely into the oral cavity and into the desired area. The introduction does not cause the patient to cough. Its correct placement can be checked with fog in the v-gel channel during exhalation or through capnography. Capnography is recommendable throughout anaesthesia in small mammals and is one of the most important parameters whilst monitoring of the patient. Occasionally we found the movement of the v-gel would obscure the airway, therefore the airway patency during surgery was best detected by capnography. It is also advisable to ensure the anaesthesia circuit is supported so its own weight does not cause movement in the v-gel. We used patches located on the circuit and the v-gel, firmly fixing to the table (Fig. 2).

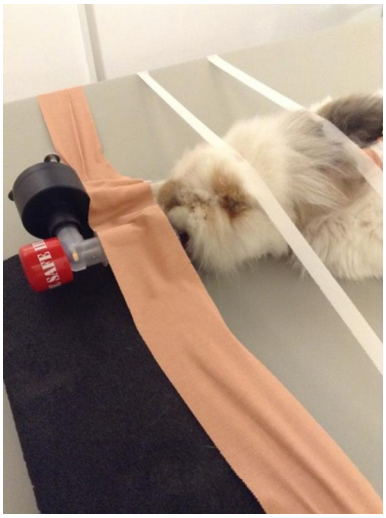

Figure 2. Patient positioning for CT scans. Fixation of the tube, monitoring of respiratory function.

Each time the patient is re-positioned, it is necessary to check the correct location of the v-gel. Extubation is very simple and did not record any complications, even in the form of induced cough. The supra-glottic mask is very well tolerated; it is possible to keep the v-gel in place almost to the waking-up and recovery of the swallowing reflex.

EXAMPLES OF THE USE OF MASK supraglottic during surgery in the head region

Case 1:

Rabbit Ferda (3 years, 1.7 kg) was reported to our department with stridor and discharge from the nasal cavity. Clinical examination did not find significant pathology occlusion. Referring veterinarian demanded CT examination of the head and sinuses. For this examination, the patient was pre-medicated intramuscularly with medetomidine (0.02 mg / kg) and ketamine (4 mg / kg). This was followed by using a face-mask connected to the inhalation anaesthesia (isoflurane, 2%). Nasal cavity in the rostral part was without pathological changes, but the caudal right nasal cavity showed apparent destruction of nasal turbinate and ethmoid parts, accumulation of material within the nasal cavity and the presence of irregular shape radio-dense body. According to the opacity it was suspected to be a fragment of bone or tooth apex. (Fig. 3, Fig. 4) Foreign body would not be feasible for endoscopic removal.

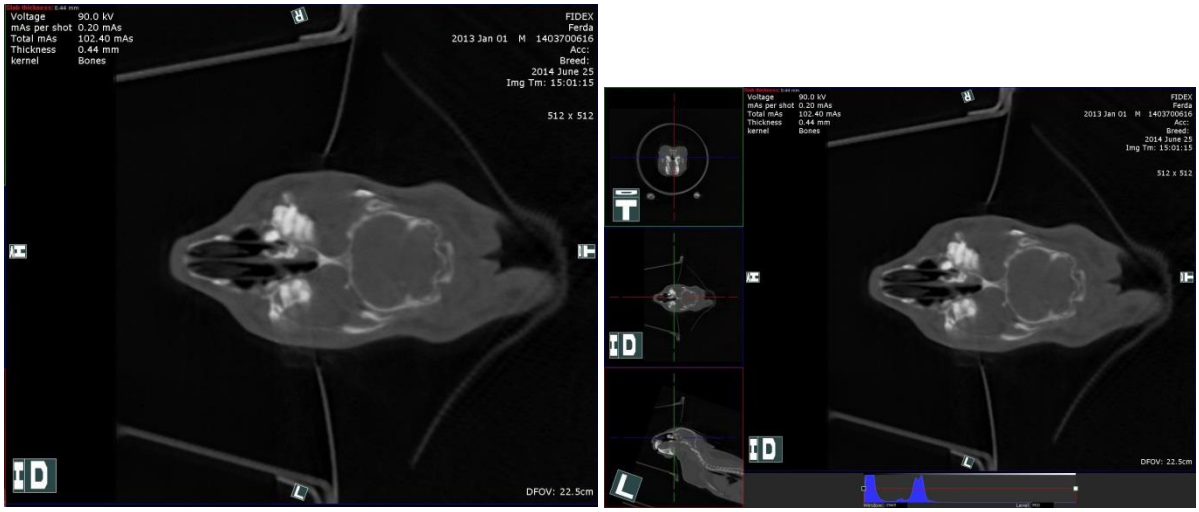

Fig.3 Radiolucent body in the nasal cavity. There are obvious artefacts caused by the presence of the mask.

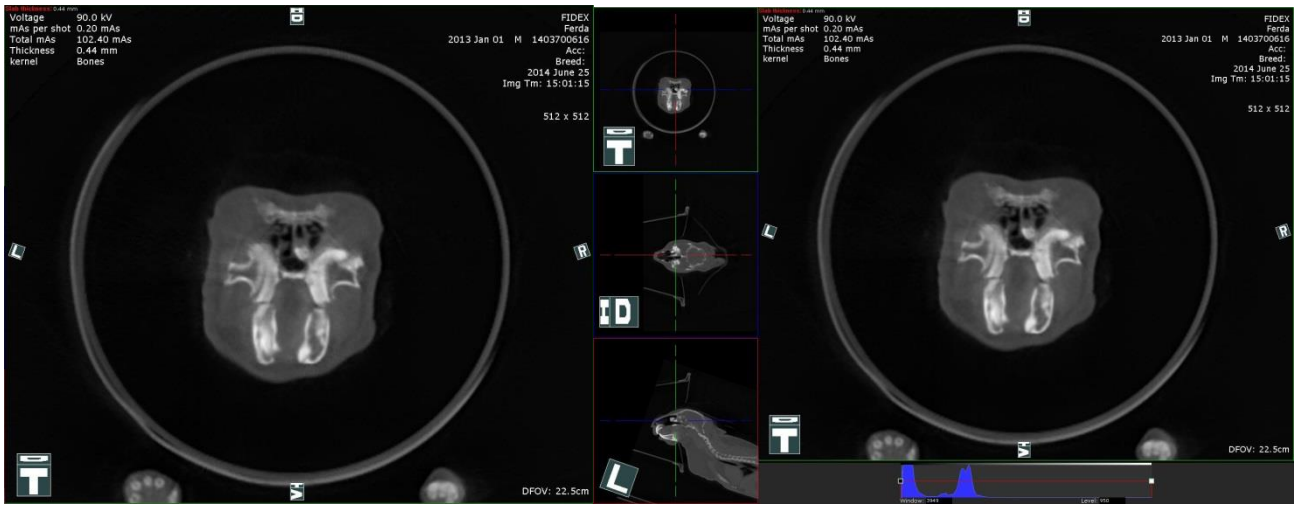

Figure 4 Radiolucent body in the nasal cavity, chronic osteomyelitis.

After talking with the owner and referring veterinarian, a week later we performed a dorsal rhinotomy. The patient was pre-medicated intramuscular medetomidine (0.02 mg / kg) and ketamine (4 mg / kg), after cannulation into v. Cephalic Propofol was administered (3mg / kg). After introduction of supraglottic mask, the patient was connected to the inhalation anaesthesia (isoflurane, 1.5%). The patient was continually monitored with capnography & ECG. The operative field was prepared (Fig. 5) and Dorsal rhinotomy was performed in a sternal position. The v-gel was fixed throughout by a patch (Fig. 6).

Figure 5. Preparation of the surgical field and the positioning of the patient for dorsal rhinotomy.

Figure 6. Opening the nasal cavity at the dorsal rhinotomy

Mineralized material was removed from the right nasal concha and a fragment of the tooth apex dimensions 9 x 3.5 x 2mm, which was covered with the nasal mucosa, and mucus. This was not investigated as, reaching into the nasal cavity, the apex of the maxillary premolars and molars could be felt. The nasal cavity was rinsed with tempered saline. Skin and subcutaneous suturing was done after repositioning nasal bones. The v-gel was removed when the swallowing reflex returned, and the patient was further awakened in an incubator at elevated oxygen saturation. After waking the patient started without difficulty to feed himself. The patient was discharged in the evening to go home. Further treatment was continued at home with oral enrofloxacin (5 mg / kg SID), meloxicam (0.3 mg / kg) and probiotics for 10 days to remove the stitches. Subsequent inspections were conducted in-referring veterinarian. The following 10 months the patient showed no clinical symptoms. Thereafter he began to repeatedly develop wheezing and sneezing. Clinical and subsequent CT examination revealed elongation Apex maxillary premolars and molars toward the left nasal cavity. The owners decided to continue the patient's treatment with conservative management (NSAIDs topical intranasal medication).

Case 2:

Niko Rabbit (4 years, 2 kg) was brought massive abscess on the ventral side of the neck, which has been repeatedly dealt with, but still expanding. In addition, Nika plagued with problems including mal-occluded incisors by which the owners had cuts with pliers. Clinical examination revealed poor nutritional status and coat condition. The patient strongly smelled putrid and was presented with bilateral epiphora. The patient had no discharge from the nasal cavity, but due to significant malocclusion of the incisors, the mandibular incisors had traumatized hard palate. In the mouth, there were uneven abrasion premolars and molars, molar 408 was considerably elongated and was releasing pus into the oral cavity. Buccal mucosa showed signs of ulceration. On the ventral side of the right frame of the mandible it was possible to palpate a rigid nodular formation, which is then followed up with a thin tract with 4 nodular formations running along the ventral side of the neck to the right axilla. One of these nodules was perforated and had putrid contents. Lymph nodes were not enlarged or painful. Basic haematology and blood chemistry were normal. CT examination of the problem areas were carried out to determine the extent of the changes and possible therapies.

For CT scan the patients was cannulated and pre-medicated with butorphanol (0.2 mg / kg IV) and midazolam (0.2 mg / kg IV). After a short face-mask induction inhalation anaesthesia, the v-gel was inserted and the patient was maintained (1.5% isoflurane) with controlled ventilation to minimize motion artefacts. Continual monitoring of respiratory function was performed. Intravenously administered contrast agent (Iodium 300 mg / ml, 2.5 ml / kg) was given and examination revealed chronic osteomyelitis of the mandible right frame, with multiple nodular mass based on apical abscess around the tooth 408, extending to the region of the right axilla (Orb. 7, Fig. 8).

Figure 7 Abscess on the ventral side of the neck.

Figure 8 Abscess on the ventral side of the neck, chronic osteomyelitis of the mandible.

Cytological samples collected by aspiration biopsy showed only a massive inflammatory reaction and confirmed the massive abscess throughout the area. Surgical intervention was advised. perioperative therapy: penicillin G (40 000 IU. / Kg IM SID), enrofloxacin (10 mg / kg SC BID), metronidazole (15 mg / kg PO BID), ranitidine (2 mg / kg IM TID), metoclopramide (0 , 5 mg / kg IM TID), meloxicam (0.3 mg / kg SC SID) probiotics. For surgery was again cannulated into v.auricularis patient was premedicated with butorphanol (0.2 mg / kg), midazolam (0.2 mg / kg) and ketamine (2 mg / kg) and after the introduction of the v-gel the patient was transferred to inhalational anaesthesia. The patient was positioned in the lateral position on the left side. Position of the v-gel was fixed to the platform using the patch. The operative field was prepared as standard. Throughout the patient was connected to a monitoring (ECG conduction, capnography). Cautiously nodules from the axilla were released toward the mandible and in the case of the last abscess, directly to the substrate bone were performed marsupialization. A drain was fitted. Skin and subcutaneous suturing was done by default. Molar 408 was extracted orally, the remainder were corrected by shortening of incisors so that the teeth fitted together and was supported by correct occlusion. After removal of putrid material from the oral cavity, the v-gel removed and the patient was further awakened in an incubator at elevated oxygen saturation. After waking the patient started to eat without difficulty. The following day the patient was discharged after drain removal treatment at home. Home was further continued in therapy initiated orally administered drugs and regular flushing of the drain. After 10 days the stitches were removed. Owners reported significant clinical improvement, increased feed intake activity. Dermis was calm, with no signs of recurrent abscess; wounds in the oral cavity were completely healed. Occlusion of the premolars and molars were satisfactory correction was made repeated occlusion of incisors. The patient showed no clinical symptoms. The patient is currently re-examined on a regular two-week interval and checked for signs of relapse.

COMMENTS

Since Spring 2014 we have completed more than 50 rabbit anaesthesia's using the v-gel and during this time there have been no serious complications associated with their use. With the correct size choice it is possible to control ventilation, ideal for Emergency medicine, mechanical ventilation during surgery or reduce motion blur when imaging diagnosis of thoracic cavity. When imaging diagnostics, particularly during CT scans of the head, the v-gel tube creates artefacts. The masks are made of durable material, easy to clean and autoclavable (the special packaging protects the v-gel during this process).

Manufacturer's (Docsinnovent, UK) website indicates the suitability of the supraglottic mask for inhalation anaesthesia during dental procedures., however our experience was only for its use on routine inspection and correction of occlusion (especially premolars and molars) not major procedures as the v-gel shape fills a large portion of the oral cavity (Fig. 9), significantly reducing the visibility and accessibility.

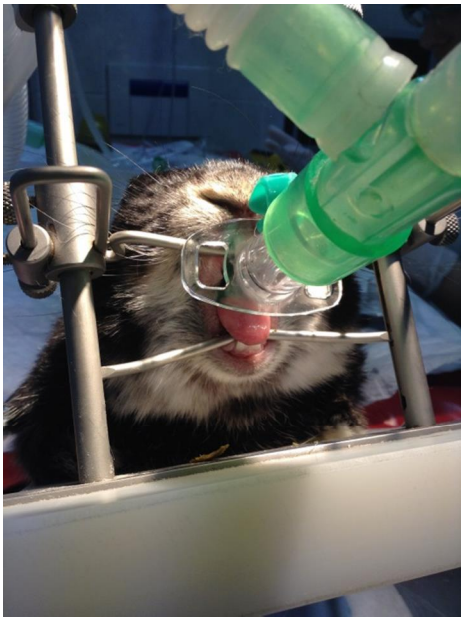

Figure 9 introduction tube significantly impedes access to the oral cavity.

This could result in damage to the mouth and tools as well as damage to the v-gel. When working in the oral cavity with the v-gel, it can also significantly increase the risk of changing the position of the v-gel. When using the v-gel in this way rigorous monitoring of correct positioning is essential. In contrast, the use of the v-gel is well-proven in extra-oral extractions of premolars and molars, in the treatment of facial abscesses, extra-orally performed dental procedures and procedures of the head, because its shape prevents aspirate material (blood, pus), which may enter into the oral cavity and Nasal cavity.

Our experiences are consistent with published studies on the use of masks in supraglottic v-gel ® (Docsinnovent, UK). Cruz (9) in his study indicates a lower consumption of anaesthetic for pre-medication in insertion of the laryngeal tube and a higher success in introducing compared with endotracheal intubation. Richardson (10), which compares the use of supraglottic masks with conventional endotracheal intubation in rabbits castration, and Schnellbacher (11) reported a positive introduction of faster and less technical demands in comparison with endotracheal intubation. This statement only supports an earlier study, which was compared to endotracheal intubation using paediatric laryngeal masks. (12) They agree, however, a high risk of movement of the tube and the importance of monitoring the patient throughout the use. Schnellbacher (10) in their study also compares the oxygen saturation during the procedure using supraglottic masks and endotracheal intubation without major deviations and histopathology confirmed minimal trauma around glottis and trachea due to the introduction of supraglottic mask. Oxygen saturation during inhalation anaesthesia using a mask, by contrast, is significantly lower. (3.12)

Studies carried out by the manufacturer (Docsinnovent Ltd) state as the main advantage of using minimum traumatization of the trachea and tracheal epithelium compared with traditional endotracheal intubation. In classical intubation, there is a risk of developing oedema, erosion and subsequent to ulceration strictures of the glottis and the trachea, especially in an area where epithelium anneals cuff endotracheal tube. These complications are often not develop immediately after intubation, but may develop 2-6 weeks after anaesthesia itself. The risk increases when repeated or long periods of time lasting intubation of the patient. It is also necessary to control the pressure in the cuff of the endotracheal tube. In contrast, the use of laryngeal masks can cause swelling in the pharyngeal region. (13)

CONCLUSION

v-gels are an easy alternative to endotracheal intubation but we recommend the use of rigorous monitoring. In comparison with the use of inhalation face masks, they provide significantly greater benefit to the patient. v-gels can be used without the need to purchase additional expensive hardware. The disadvantage of using these masks is, according to the author's experience, the difficulty of their use in the intra-oral dental procedures performed in premolars and molars.

References

(1) Wenger, S. Anesthesia and analgesia in rabbits and rodents. Journal of Exotic Pet Medicine, 2012;21:7-16
(2) Lenox, A.M., Capello, V. Tracheal Intubation in Exotic Companion Mammals. Journal of Exotic Pet Medicine, 2008;17(3):221-227
(3) Bateman, L., Ludders, J.W., Gleed, R.D. Comparison between facemask and laryngeal mask airway in rabbits during isoflurane anesthesia. Veterinary Anaesthesia and Analgesia 2005 32:280-288
(4) Broadbelt, D.C., Blissitt K.J., Hammond, R.A., et al. The risk of death: the Confidental Enquiry into Perioperative Small Animal Fatalities. Veterinary Anaesthesia and Analgesia 2008;35(5):365-373
(5) Grint, N.J., Sayers, I.R., Cecchi, R., et.al. Postanestetic tracheal strictures in three rabbits. Laboratory Animals, 2006;40:301-308
(6) Panwar, M., Bharadwaj, A., Chauhan, G., et al. Intubating laryngeal mask airway as an independent ventilatory and intubation device. A comparsion between supine, right lateral and left lateral. Korean Journal of Anesteziology, 2013;65(4):306-311
(7) Jagannathan,N., Ramsey, M.A., White, M.C., et al. An update on newer pediatric supraglottic airways with recommendations for clinical use. Pediatric Anesthesia, 2015;25(4):334-345
(8) Ramachandran, S.K., Kumar, A.M. Supraglottic airway device. Respiratory Care, 2014;59(6):920-932
(9) Cruz, M., Sacci, T., Luna, S., et.al. Use of a laryngeal mask for airway maintenance during inhalation anaesthesia in rabbits. Veterinary Anaesthesia and Analgesia. 2000;27:112-116.
(10) Richardson, J., Perpinan D., Hedley, J., et al. Use of supraglottic airway device to maintain gaseous anesthesia in rabbits (Oryctolagus cuniculus). In: Proceedings of 2nd International Conference on Avian Herpetological and Exotic mammal medicine. Paris;2015:387
(11) Schnellbacher, R., Blas-Machado, U., Quandt J., et al. Comparsion between endotracheal intubation and laryngeal mask airwai in New Zealand rabbits undergoing laparotomy. In: Proceedings of 2nd International Conference on Avian Herpetological and Exotic mammal medicine. Paris;2015:388
(12) Brimacombe, J. The advantages of the LMA over the trachealtube or facemask: a meta-analysis. Canadian Journal of Anaesthesia, 1995;42(11):1017-1023
(13) Phaneuf, L. R., Barker, S., Groleau, M. A. et.al. Tracheal Injury after Endotracheal Intubation and Anaesthesia in Rabbits. Journal of the American Associaiton for Laboratory Animal Sciences, 2006, 45:67 - 72

Address of the author:DVM. Martina Ploskov, Animal Clinic, Čistovická 44, 16300 Praha 6,
www.animalclinic.cz
mail: m.ploskova@centrum.cz