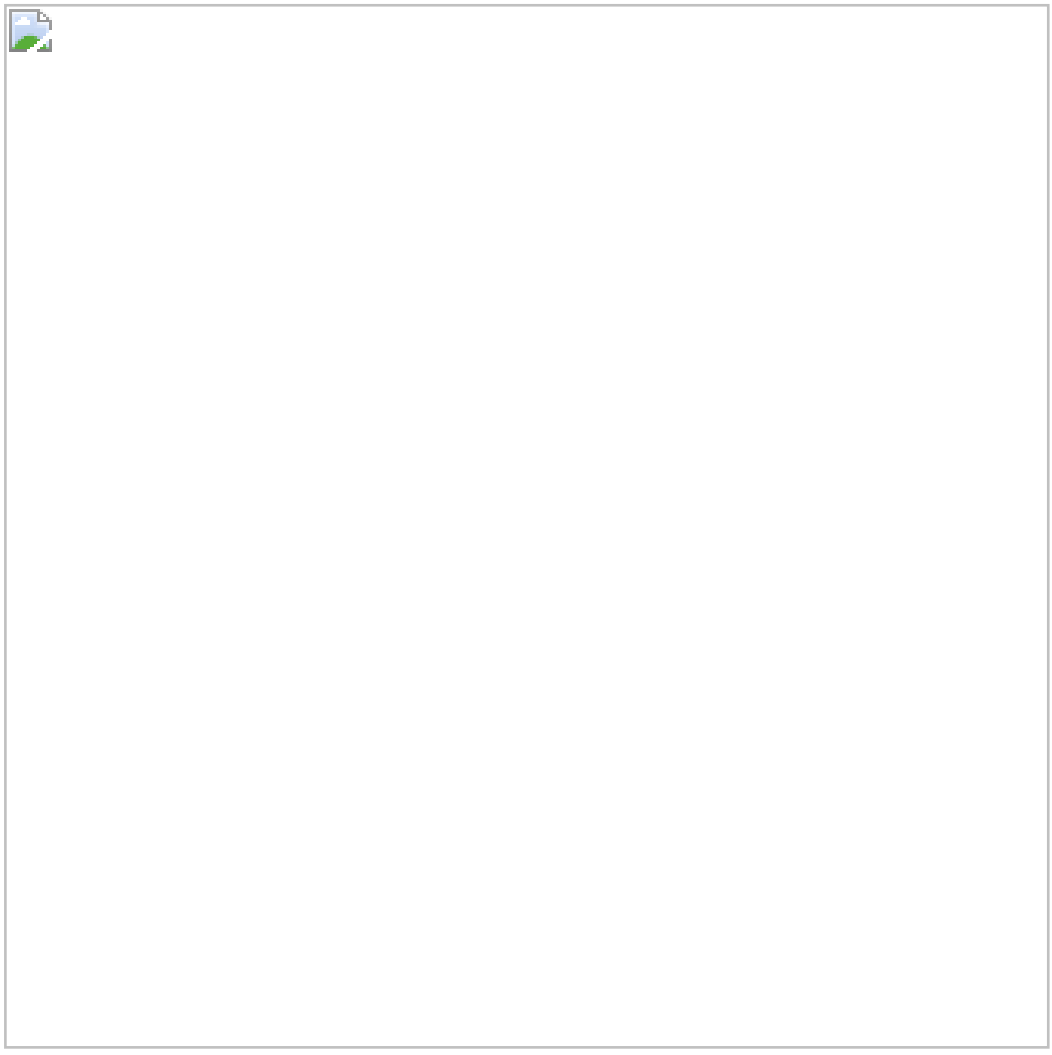

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Case Series

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Lidocaine-saturated cotton tip applicator used for laryngeal desensitization resulting in an iatrogenic tracheobronchial foreign body in two cats

Kamila A Correa, Emily P Wheeler, Victoria S Miller and Meredith E 't Hoen

Abstract

Case series summary Two cats were referred to a veterinary teaching hospital with a cotton tip applicator (CTA) tracheobronchial foreign body (FB) after induction of anesthesia for an elective dental cleaning. In both cases, a lidocaine-saturated CTA, utilized to desensitize the larynx before endotracheal (ET) intubation, broke when introduced into the oropharynx and was subsequently aspirated into the tracheobronchial tree. Both CTAs were successfully removed bronchoscopically, and the cats survived with no short- or long-term complications noted.

Relevance and novel information Utilizing a lidocaine-saturated CTA to facilitate ET intubation in cats is not well described, and information on the relative risks and benefits of this specific method for laryngeal desensitization is lacking. This retrospective case series is the first to describe a complication of this technique and successful treatment. These cases highlight the risk inherent to using a CTA to desensitize the feline larynx.

Keywords: Cotton tip applicator; laryngeal desensitization; tracheobronchial foreign body; supraglottic airway device; lidocaine

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Introduction

Feline endotracheal (ET) intubation can be challenging owing to a naturally small airway and laryngospasm, which can occur spontaneously or after mechanical stimulation of the soft palate, pharynx and larynx.[1,2] One widely used strategy to reduce laryngospasm and facilitate ET intubation is the topical application of lidocaine to desensitize the larynx. There is no consensus on the most effective technique to achieve laryngeal desensitization. The two most frequently cited methods to deliver lidocaine on the larynx include using a syringe, with or without an attached catheter to guide delivery, or aerosolization of lidocaine with a nozzle.[3–5] Another infrequently described technique is application using a lidocaine-saturated cotton tip applicator (CTA).[6] The purpose of this case series is to describe the successful management of a previously unreported complication occurring during desensitization of the feline larynx using the CTA technique.

Case series description

Case 1

An 11-year-old female spayed domestic shorthair (DSH) cat weighing 3.1 kg was presented to a veterinary teaching hospital for evaluation of a tracheal foreign body

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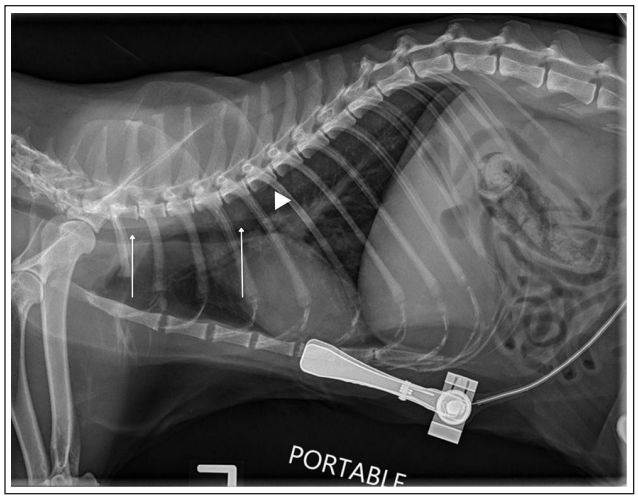

Figure 1 Thoracic radiograph (left lateral view) obtained immediately before bronchoscopy showing an opaque linear structure in the lumen of the caudal thoracic trachea (arrows) and a small soft tissue opaque structure with clear margins superimposed over the lumen of the terminal trachea at the hilus (arrowhead)

Figure 2 The cotton tip applicator can be observed in the intrathoracic trachea with the cotton end obstructing the right principal bronchus

(FB). The cat had been seen earlier that day at the primary veterinarian for a routine dental procedure. There, it received dexmedetomidine (5 µg/kg IM), butorphanol (0.1 mg/kg IM) and ketamine (1 mg/kg IM). When a CTA saturated with lidocaine was introduced into the oropharynx to desensitize the larynx before intubation, the patient bit the CTA into two pieces and the distal tip was missing. A lateral thoracic radiograph performed by the primary veterinarian revealed the CTA piece in the terminal trachea at the hilus. No further treatment was administered. The cat was referred for removal of the CTA.

On presentation to the authors' institution, the patient's heart rate was 180 beats per minute, temperature was 39.3°C (102.8°F) and the patient was eupneic with a respiratory rate of 32 breaths per minute. Cardiothoracic auscultation revealed increased bronchovesicular sounds in the right hemithorax. The remainder of the examination was unremarkable.

The patient was sedated in the emergency room with acepromazine (0.09 mg/kg IM) and butorphanol (0.38 mg/kg IM) to facilitate intravenous (IV) catheter placement. Before anesthesia, the cat was premedicated with dexmedetomidine (2 µg/kg IV). Repeat thoracic radiographs confirmed a tracheal FB compatible with the reported CTA aspiration (Figure 1). Anesthesia was induced with propofol (3.8 mg/kg IV). The cat was intubated with a cuffed 5 mm endotracheal tube (ETT) after desensitization of the larynx with lidocaine using an atomizer, placed on a non-rebreathing circuit for oxygen administration and maintained under anesthesia with propofol (400 µg/kg/min IV). Lactated Ringer's solution (LRS) was administered at 5 ml/kg/h IV.

The trachea was extubated to allow for bronchoscopy with a flexible bronchoscope, with a 3.8 mm insertion tube diameter, 1.2 mm instrument channel and 60 cm working length. The cotton tip portion of the CTA was observed in the intrathoracic trachea obstructing the right principal bronchus (Figure 2). The FB was extracted with no complications by passing basket forceps through the operating channel. The trachea was then re-intubated. Repeat thoracic radiographs confirmed complete FB removal with no abnormalities observed.

The effect of the dexmedetomidine was antagonized with atipamezole (0.035 mg/kg IM), the cat recovered uneventfully from anesthesia and was discharged the same day with gabapentin (13 mg/kg PO q12h) and amoxicillin–clavulanic acid (16 mg/kg PO q12h). The cat was reportedly doing well during a follow-up phone call 10 months later.

Case 2

An 8-year-old female spayed DSH cat weighing 5.3 kg was presented to a veterinary teaching hospital for evaluation of a tracheal FB. The cat had been seen earlier that day at the primary veterinarian for a routine dental procedure. There, it received atropine (0.06 mg/kg IM) and propofol (dose unknown IV). When a CTA saturated with lidocaine was introduced into the oropharynx to

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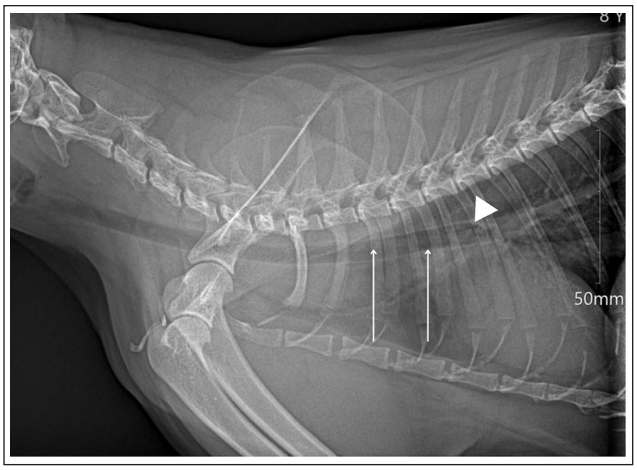

Figure 3 Lateral thoracic radiograph obtained by the primary care veterinarian after the cotton tip applicator broke, showing an opaque linear structure in the lumen of the caudal thoracic trachea (arrows) and a small soft tissue opaque structure with clear margins over the lumen of the terminal trachea at the hilus (arrowhead)

Figure 4 Case 2 intubated with a supraglottic airway device (SGAD)

desensitize the larynx before intubation, patient movement caused the CTA to break.

It was initially unclear if the patient swallowed or aspirated the CTA. Thoracic and abdominal radiographs were obtained. The FB was thought to be in the abdomen. The cat received additional propofol (dose unknown IV), the trachea was intubated (ETT size unknown) and the cat was maintained under general anesthesia using isoflurane (fraction of inspired oxygen unknown). An exploratory laparotomy was performed; no CTA was identified in the gastrointestinal tract. The dental procedure was then performed. After these procedures, upon re-evaluation of the thoracic radiograph (Figure 3), a FB was noted in the thoracic trachea. Examination of the trachea was unsuccessfully attempted using a rigid bronchoscope. The cat recovered uneventfully, received butorphanol (0.4 mg/kg IM) and cefovecin (8 mg/kg SC), and was referred for further care.

On presentation to the authors' institution, the cat's heart rate was 223 beats per minute, temperature was 37.2°C (99°F), and it was tachypneic (48 breaths per minute) and eupneic. Cardiothoracic auscultation revealed increased upper airway sounds. A ventral midline abdominal incision was present. The remainder of the examination was unremarkable other than mild sedation and historically noted left microphthalmia.

The cat received ampicillin–sulbactam (30 mg/kg IV), was premedicated with butorphanol (0.09 mg/kg IV), and anesthesia was induced with alfaxalone (0.47 mg/kg IV) and midazolam (0.18 mg/kg IV). A supraglottic airway device (SGAD [size 5 v-gel; Docsinnovent]) was placed to allow provision of an airway and ventilation (Figure 4). The patient was placed on a non-rebreathing circuit for oxygen administration and maintained under anesthesia with alfaxalone (0.1–0.15 mg/kg/min IV). LRS was administered at 4 ml/kg/h.

The SGAD was removed and bronchoscopy performed using a flexible bronchoscope with a 4.9 mm insertion tube diameter, 2 mm instrument channel and 60 cm working length. The CTA was observed at the carina with the cotton portion lodged in the left mainstem bronchus. Grasping retrieval forceps were passed through the operating channel for successful extraction of the FB. The patient was subsequently intubated with a cuffed 4.5 mm ETT. Thoracic radiographs confirmed complete removal of the FB with no abnormalities observed. The cat received buprenorphine (0.009 mg/kg IV) to provide analgesia for the dental procedure and exploratory laparotomy performed earlier that day and allowed to recover. After extubation, the cat received flumazenil (9 µg/kg IV) and naloxone (9 µg/kg IV) because of persistent sedation, which improved with antagonist administration.

The patient was hospitalized for overnight monitoring and placed in an oxygen cage owing to prolonged anesthetic recovery and persistent sedation with intermittent oxygen-responsive desaturation. Therapy in hospital consisted of LRS (60 ml/kg/day IV), buprenorphine (0.02 mg/kg IV q8h) and ampicillin–sulbactam (30 mg/kg IV q8h). The following morning, the cat was fully recovered and subjectively assessed to be comfortable. It was discharged with buprenorphine (0.02 mg/kg PO q8h), amoxicillin–clavulanic acid (11.8 mg/kg PO q12h) and robenacoxib (1.1 mg/kg PO q24h). The patient was reportedly doing well at home during a follow-up phone call 1 month later.

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Discussion

Tracheobronchial FBs are uncommonly reported in feline patients, with vegetal and mineral being most frequently described.[7–9] Iatrogenic tracheobronchial FBs have not been previously reported. To the authors' knowledge, this is the first report of a lidocaine-saturated CTA becoming a tracheobronchial FB.

The diagnosis of a tracheobronchial FB is made based on history, physical examination and imaging. Thoracic radiographs are the most cost-effective imaging modality. However, diagnosis can be challenging as a result of low sensitivity and specificity, as the relative radiodensity of some FBs compared with adjacent structures can be similar, making visualization of the foreign material difficult.[10] This difficulty was highlighted in case 2. Other diagnostic modalities with better sensitivity and specificity include CT, bronchoscopy and fluoroscopy,[8–11] but are not readily available in general practice.

Neither cat displayed signs of respiratory distress, likely because the CTA was small enough to progress to the level of the bronchus and not completely obstruct the trachea. A retrospective study of tracheobronchial FBs in cats showed 50% of FBs were located in the trachea while 50% were in the bronchial tree.[8] Therefore, lack of respiratory distress in cats suspected to have aspirated a CTA should not rule out a tracheobronchial FB.

The American Association of Feline Practitioners (AAFP) 2018 Anesthesia Guidelines recommend topical application of 2% lidocaine by utilizing a 1 ml syringe to drop 0.2 ml of lidocaine on the larynx with no direct contact to the arytenoid cartilages and/or vocal folds.[3] The guidelines discourage needle or catheter placement on the syringe to prevent inadvertent detachment and aspiration and do not mention the use of a lidocaine-saturated CTA.[3] In addition, caution must be used with a lidocaine aerosol as high pressures can damage the laryngeal mucosa.[4] The use of a lidocaine-saturated CTA to desensitize the feline larynx has been described,[6] but to the authors' knowledge, no studies evaluating this technique's risks, benefits or efficacy exist. In both cases, the CTA broke during the process of using this technique, resulting in an iatrogenic tracheobronchial FB. In case 1, the cat was known to have bitten the CTA, whereas in case 2, the exact circumstances leading to the CTA breaking were unclear. As this technique to desensitize the larynx involves introducing an easily breakable object into the oral cavity, it innately increases the risk of aspiration if a patient is stimulated enough during the process to react by biting the CTA.

The anesthetic protocol chosen for each cat in this report to facilitate bronchoscopy was at the discretion of the attending anesthesiologist. Case 1 was intubated with an ETT before bronchoscopy, whereas case 2 had a SGAD placed. SGADs are cited in the veterinary literature as an alternative to ET intubation as they can be placed blindly, require lower doses of anesthetics for insertion and are linked with a lower incidence of iatrogenic tracheal lesions, spasms or coughing.[12–15] SGAD as opposed to ET intubation may be an option in cases where there is concern for further airway damage by displacing a tracheal FB. There are no published reports of using an SGAD during general anesthesia in cats with a known tracheal FB. The authors recommend considering using an SGAD in cats known or suspected to have a tracheal FB to prevent possible movement of the FB resulting in tracheal trauma.

Conclusions

This report describes the first two documented cases of CTA aspiration into the feline tracheobronchial tree after an attempt to desensitize the larynx. This highlights an inherent risk to using CTAs for this purpose. The authors recommend against the use of lidocaine-saturated CTAs to desensitize the feline larynx before ET intubation and that other techniques be utilized. There is no documented benefit to the CTA technique that outweighs the risks. If aspiration of a CTA does occur, prompt recognition and intervention can lead to a successful outcome with no complications. In the event a CTA breaks in the oropharynx and a piece is missing, the authors recommend the airways be evaluated even if the CTA cannot be definitively seen on radiographs as in both cases the missing piece was in the airway and not the gastrointestinal tract.

Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognized high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers, tissues and samples) for all procedure(s) undertaken (prospective or retrospective studies). For any animals or people individually identifiable within this publication, informed consent (verbal or written) for their use in the publication was obtained from the people involved.

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