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An unusual foreign body in a cat: a case report

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ABSTRACT: Foreign bodies that affect airways are a well-recognised problem in small-animal practice. Cats in particular, may be especially at risk of aspiration due to their predatory behaviour. Here, we report a case of an insect as a foreign body, namely a beetle in the tracheal bifurcation of a cat. Radiographs suggested a wide range of possibilities for differential diagnosis, but the presence of a foreign body was initially suspected. A final diagnosis was not pursued by the owner and the cat was euthanised. The presence of a summer chafer was then confirmed. To the authors' knowledge, this is the first time such a foreign body and radiographic findings are reported in the literature.

Keywords: aspiration; beetle; dyspnoea; summer chafer

Any materials of relative small size, which enter into the airways by inhalation and cannot be eliminated by conventional methods like sneezing, coughs, gagging, etc., present as respiratory foreign bodies. Foreign bodies in the airways are commonly found in the nasal cavity, nasopharynx, larynx, trachea and bronchi. Although most foreign particles enter the airways from outside, regurgitation or vomiting can also lead to aspiration resulting in complicated pneumonia or bronchopneumonitis. Foreign bodies such as needles, fishhooks, bones and grass awns are among the most common objects. Interestingly, the incidence of respiratory foreign bodies may be affected by season. For instance, in late summer or autumn, hunting dogs may be at risk of inhaling awns or foxtails when running through fields with their mouths open. Puppies or kittens can aspirate foreign bodies associated with playing or teething (as well as older animals with poor dentition). Dogs and cats recovering from anaesthesia may bite endotracheal tubes and small portions may stay in the tracheal lumen (Nutt et al. 2014). A meta-analysis of aspirated foreign bodies in cats described needles, a safety pin, wood mulch, a tooth, gravel, bone and a bullet (Tivers and Moore 2006). Clinical symptoms associated with airway obstruction include sudden onset of dyspnoea with coughing, retching or gagging (Levitt et al. 1993). Some episodes may conclude with fatal consequences. Partial or chronic obstruction may be associated with varying degrees of dyspnoea, chronic coughing, haemoptysis, halitosis and other symptoms associated with possible migration like pneumonia, pneumothorax, pulmonary abscess or pyothorax (Levitt et al. 1993; Tenwolde et al. 2010). Tracheal and bronchial foreign bodies in the cat have been infrequently reported in the veterinary literature (Levitt et al. 1993). We present a case of a cat that died after aspirating a beetle. According

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to the authors' knowledge, this is the first report of an aspirated insect in a feline patient.

Case report

A 1.5-year-old female domestic shorthair cat, weighing 2.5 kg, was referred to the Small Animal Clinic at the University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic for evaluation of an acute episode of dyspnoea. The owner noticed increased salivation and shortness of breath since the preceding night over the course of four hours after the cat had returned inside. After visiting their private practitioner, enrofloxacin, oxyphyllin, and corticosteroids at unknown doses were administered seemingly without positive effects. The cat was at that time nursing a three-week-old litter and was receiving the recommended vaccinations and deworming.

At presentation, the patient appeared depressed, dehydrated (approximately 6%), tachypneic (80 rpm), hypothermic (34.7 °C) and the mucous membranes were cyanotic. The cat exhibited a mild inspiratory effort that worsened with manipulation. Thoracic auscultation revealed bilateral pulmonary crackles. No heart murmur or additional heart sounds were detected. Flow-by oxygen administration was commenced. After initial stabilisation, an intravenous catheter was placed and blood for complete blood count (CBC) and biochemical profile were collected. Results revealed leucocytosis (39.4×10^9/l) with neutrophilia (32.9×10^9/l) and left shift (1.48×10^9/l), hyperglycaemia (23 mmol/l), increased urea (13 mmol/l), hyperproteinaemia (91 g/l), hyperalbuminaemia (36.4 g/l) (albumin/globulin ratio: 0.66) and hypokalaemia (3.1 mmol/l). The cat was negative for feline viral leukaemia (FeLV) and immunodeficiency (FIV) (SNAP FIV/FeLV Combo Test, Idexx Europe, The Netherlands). A single dose (4 mg/kg *i.v.*) of furosemide (Furosemide forte, BB Pharma, Czech Republic) was administered and thoracic radiographs were taken to rule out a wide range of conditions such as pneumonia, pulmonary oedema, pleural effusion and other causes of dyspnoea. On radiographs, the lungs appeared hyperinsuflated with a diffuse bronchial pulmonary pattern and normal heart size (Figure 1). Furthermore, on the lateral view cranial to the carina a possible radiolucent mass effect of a few millimetres in size was present. Echocardiography which was performed to rule out cardiac disease was normal.

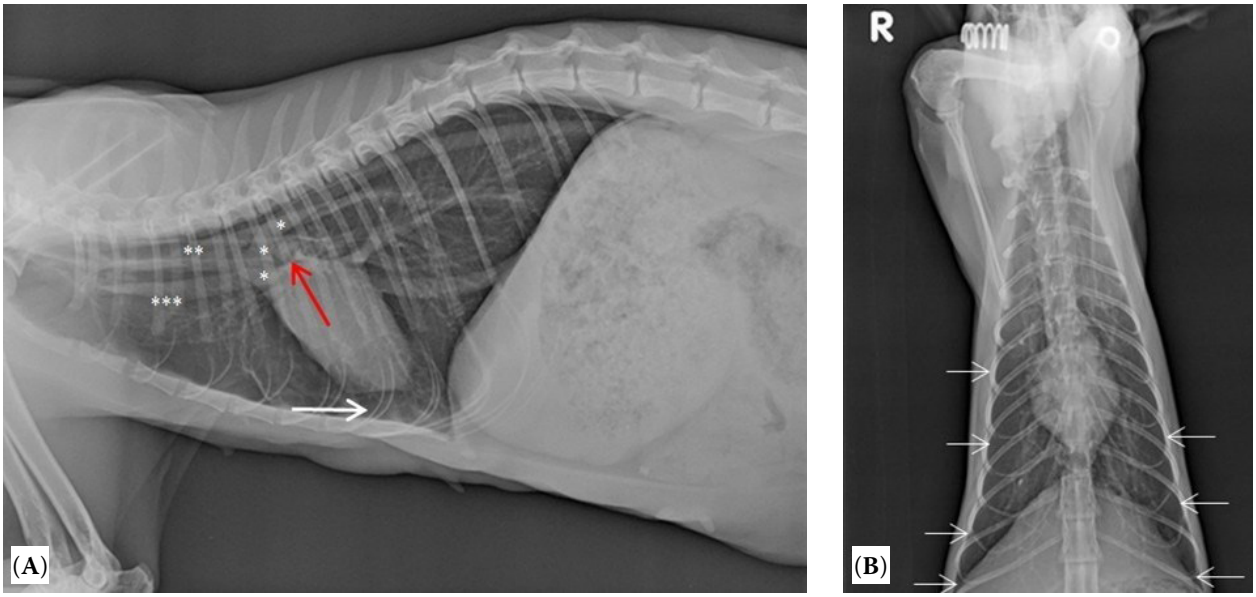

Figure 1. Thoracic radiographs of a dyspnoeic cat. (**A**) Laterolateral view: small amount of air in the mediastinal space allowing visualisation of the aorta (*), cranial vena cava (**) and oesophagus (***). The heart silhouette has normal vertebral heart size index (7 v.) and seems elevated over the sternum (white arrow). Lung parenchyma shows a generalised pulmonary bronchial pattern. There is a radiopaque mass-like shadow on the tracheal bifurcation only evident in the lateral view (red arrow). (**B**) Dorsoventral view: the lung lobes extend to the edges of the thoracic wall and the caudal lung lobes reach the first lumbar vertebral body demonstrating lung hyperinflation (white arrows)

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Treatment continued in an oxygen cage with correction of dehydration using lactated Ringer, sedation (butorphanol as needed at 0.2 mg/kg *i.m.*, Torbugesic, Zoetis Manufacturing and Research, Spain), aminophylline (8 mg/kg *i.v.*) three times a day (TID) (Syntophyllin, BB Pharma, Czech Republic), furosemide (2–4 mg/kg *i.v.* TID) and famotidine (0.5 mg/kg *i.v.* once a day) (Quamatel, Gedeon Richter Plc., Hungary). The owner was informed about the presence of a possible mass or foreign body in the airways but due to financial reasons could only agree to emergency laryngoscopy. Anaesthesia was induced with propofol (2 mg/kg *i.v.*, Norofol, Norbrook Laboratories Limited, Northern Ireland) and careful exploration of the mouth, pharynx, larynx and cranial aspect of the trachea did not demonstrate abnormalities. Therapy continued unchanged but the clinical status worsened and the respiratory pattern was now characterised by clear inspiratory effort. As the lack of a complete bronchoscopic examination meant that prognosis was poor, the owner requested euthanasia and agreed to donate the body for necropsy.

Necropsy findings. Significant gross postmortem findings included mild liver congestion and right ventricular hypertrophy, and the lungs exhibited small areas of atelectasis, hyperaemia, small petechial haemorrhages and mild oedema. A foreign body of approximately 1 cm in diameter, with a round shape, coated with a thick layer of white-coloured mucus, filling completely the lumen of the trachea, was found approximately 2 cm cranial to the tracheal bifurcation. Strikingly, the foreign body was identified as a beetle (Figure 2). At the site of the foreign body, the tracheal mucosa was hyperaemic with small petechial haemorrhages and erosions.

Entomology. The beetle was a summer chafer (*Amphimallon solstitiale*), also known as the European June beetle. Adults measure approximately 10 millimetres in length; from April to June they can be frequently observed flying around tree tops looking for a mate and they can often be found drowning in pools of water the following morning (Balthasar 1956). The cat apparently tried to catch or play with it and aspirated the beetle.

DISCUSSION AND CONCLUSIONS

Acute airway disease is a challenging situation in the emergency room. Several situations leading to airway obstruction can be determined based on the history and clinical examination. In patients with marked inspiratory dyspnoea, upper airway obstruction or a condition affecting the pleural space preventing full lung expansion should be diagnosed. Patients with predominantly mixed dyspnoea (it is not common to observe patients suffering exclusively from expiratory dyspnoea) probably have lung or bronchial disease. Upper airway obstruction may be accompanied by sneezing, nasal discharge, wheezing, snoring, snorting or dysphagia. The present patient was an example of a challenging situation, who at first presentation exhibited a mixed dyspnoea pattern, which in combination with the radiographic and ultrasonographic findings led us to suspect lower airway disease (lung hyperinflation). However, during hospitalisation, the dyspnoea developed into a clear inspiratory pattern. The administration of bronchodilators like aminophylline (although weaker when compared with terbutaline, for example) before any manipulation can help to prevent bronchospasm and coughing. Unfortunately, the use of

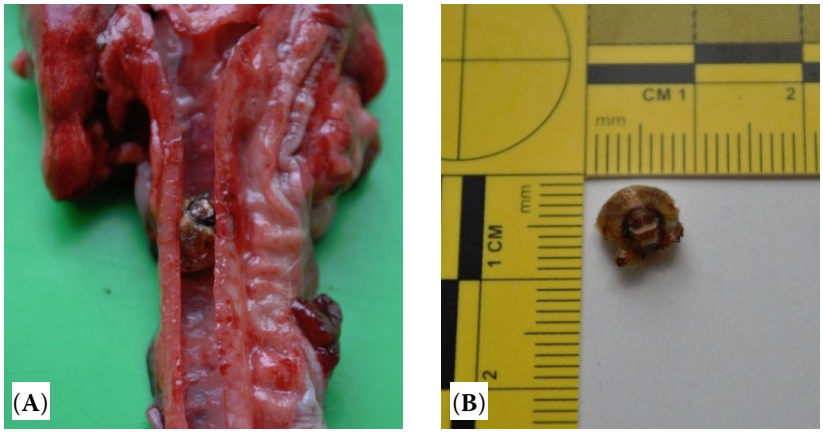

Figure 2. (**A**) Post-mortem view of the trachea showing hyperaemia and small haemorrhages. There is a foreign body obstructing the trachea. This foreign body is a European June beetle (*Amphimallon solstitiale*). (**B**) A closer picture of the beetle's morphology and its measurement (approx. 1 cm)

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laryngoscopy did not permit us to detect the beetle that probably already occluded air passage in the trachea. Bronchoscopy should be recommended in all cases where obstruction of the airways is present (Jones and Roudebush 1984; Nutt et al. 2014), but in our case this was not performed due to financial constraints. The cat was then euthanised to avoid prolonged suffering. Depending on the experience of the operator the vast majority of foreign objects may be removed endoscopically without the need for surgery. However, removal of foreign bodies in the trachea may be challenging because such patients may have complications like hypoxia or hyperthermia and such procedures are further limited in most cats by the small diameter of the trachea (Jones and Roudebush 1984; Levitt et al. 1993; Nutt et al. 2014). In these cases, a small-diameter flexible fiberscope (3 mm or less) with a working channel of 1.2 mm may be used to explore feline airways. One veterinary study reported a success rate of 40% when using bronchoscopy for foreign body extraction in cats (Tenwolde et al. 2010). Using forceps with fluoroscopy to remove tracheal foreign bodies may be faster than endoscopy and may thus decrease the duration of anaesthesia; however, grasping the end of a foreign body may increase trauma to the adjacent tracheal wall (Nutt et al. 2014). Nevertheless, such examination should be accompanied by bronchoalveolar lavage and cultivation, because foreign bodies often cause secondary bacterial infection of the respiratory tract or migrate to other places in the body like the thoracic cavity, heart and abdomen, leading to bronchopneumonia, pyothorax, abscesses or pneumothorax or haemoabdomen.

Alternative methods in cases when bronchoscopy or fluoroscopy are unsuccessful or not possible include computer tomography (CT), a presternal tracheotomy to illuminate and view the object prior to grasping with forceps or a thoracotomy for direct removal via thoracic tracheotomy (Levitt et al. 1993; Tivers and Moore 2006; Tenwolde et al. 2010).

Thoracic radiographs are useful to rule out foreign bodies in the airways. In this case, the lateral view showed a radiopaque shadow cranial to the carina (Figure 1) that suggested the presence of a mass or foreign body. One study demonstrated that, in cats, the most common location was the trachea or carina, and this finding was expected given the much narrower luminal diameter in felines as compared with canine bronchi even when considering animals of similar body weight (Tenwolde et al. 2010). Also, a bronchial pattern with evidence of lung parenchymal over-inflation was present (generalised increased radiolucency, increased vascular pattern and elevated heart silhouette). Hyperinflated lungs are consistent with primary lung diseases such as feline allergic bronchitis, parasitic disease and toxoplasmosis among others. Hyperinflation may have occurred due to the inhalation of air and it leads to decreased exhalation resulting in turn in the gradual trapping of air in the alveoli which increases the radiolucency. In some instances, the air may escape to the pleural or mediastinal space leading to pneumothorax or pneumomediastinum as observed in this case (Mackling effect) (Bay and Johnson 2004; Thomas and Syring 2013). One report found that a common cause of pneumomediastinum in cats was general anaesthesia with endotracheal intubation and positive pressure ventilation, followed by trauma and, less frequently, tracheal foreign bodies (Thomas and Syring 2013); however, none of the above could be confirmed in the necropsy. Other reported radiographic changes in foreign body aspiration are focal pulmonary to interstitial opacities, pneumothorax, pleural effusion or pleural thickening (Tenwolde et al. 2010). Pneumothorax can be ruled out by determining the presence of lung tissue on the edges of the thoracic cavity on both the lateral and ventrodorsal views meaning that there is no air surrounding the lung lobes, although the cardiac silhouette may be elevated (air trapping within the alveoli due also to over-inflation). There is a significant association between radiographic and CT lesions and the gross sites of abnormality. Once foreign bodies reach a smaller bronchus they may be seen on radiographs as focal interstitial to alveolar infiltrates (2/3 of cases). In such situations, CT might be more accurate and time-efficient in identifying foreign body location before interventional therapy. A number of other CT abnormalities resulting from the presence of foreign bodies include pulmonary opacities, pleural effusion or thickening of pleura, pneumothorax and the tracing of the path of the foreign bodies (Schultz and Zwingenberger 2008).

In general, tracheal foreign bodies are occasionally seen in cats. Foreign bodies may be coughed up or can pass beyond the tracheal bifurcation to lodge deep within the bronchial tree; however, if they are large enough, they often lodge at the tracheal bifurcation (Levitt et al. 1993; Tivers and Moore

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2006). Pathomorphological features of lesions in the wall and mucosa of the respiratory tract depend on whether the foreign body fills the lumen of airways partially or completely and on anatomical localisation. Complete obturation of the main airways may lead to death due to asphyxiation. Pathoanatomical findings in such case are nonspecific and can be associated with other causes of death. In cases where there is no complete obturation of airways, severe oedema and pressure necrosis of the mucosal layer can develop and death can occur later after several hours (Merck and Miller 2013). Hyperinflation of lungs may develop after the inspiration of a large amount of air followed by little or no air expiration and the subsequent development of acute lung emphysema (the foreign body can also act as a valve) (Bay and Johnson 2004). Sharp-edged subjects can insert themselves into the wall of the trachea or bronchi, with the formation of abscesses or even with perforation into mediastinum. Small particles (like dust, ash, sawdust, sand, etc.) that are inhaled up to the bronchiole and alveoli may develop into atelectatic foci sharply demarcated from surrounding tissue, or may lead to acute onset of emphysema.

The diet of cats frequently includes several kinds of invertebrates such as spiders, woodlice or insects. Different groups of insects including beetles are usually present in 0.5–18% of the scats of wildcats (Sarmento 1996) and also feral domestic cats (Woods et al. 2003; Medina and Garcia 2007). Larger insects catch the attention of cats and activate their hunting instincts very often. Adult summer chafers are active mostly at nightfall and during the night. In cities, they are attracted to light; for that reason, they frequently fly in large numbers around various house lights or street lightings. Many beetles can be found on the ground under such lights where they can be easy prey for cats.

An unusual case of the aspiration of a beetle is presented. The diagnosis was made on the basis of post mortem pathological examination; however, retrospectively, we suspect that the insect was present at radiographs, but endoscopy was ruled out because of the high costs. In previously published reports of aspirated foreign bodies in cats there is no description of the presence of insects. This case demonstrates that aspiration of unusual foreign bodies should be considered as a differential diagnosis in feline patients presenting with acute dyspnoea.

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