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Removal of a tracheal foreign body by intercostal thoracotomy in a cat

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ABSTRACT: In this case report, we describe a five-year-old, mixed-breed, neutered male cat weighing 5.7 kg, that was referred to the Near East University Animal Hospital with complaints of dyspnoea, cough and lack of appetite over the preceding two days. Clinical examination revealed marked wheezing during expiration, severe shortness of breath and associated cyanosis. A blood sample was drawn for full blood count, serum biochemical and blood gas analyses. Laterolateral and ventrodorsal radiographic images of the thorax and abdominal region were obtained. A radiopaque foreign body measuring 3 × 9 × 13 mm was detected at the carina of the trachea, aligned in the midst of the fifth–sixth intercostal space. Considering that this foreign body obstructed the tracheal lumen almost completely and had been creating pressure on the tracheal wall for at least two days and also with the aim of preventing potential complications (tracheal rupture, laceration, etc.), after repeated unsuccessful interventions to minimise the time spent under anaesthesia, the object was removed by intercostal thoracotomy. The subject was discharged on the sixth postoperative day and regained its normal state within a short time.

Keywords: aspiration; carina trachea; lower respiratory tract; pebble

Foreign body objects in respiratory systems are rarely seen in cats and dogs with the frequency being lower in cats than in dogs (Hayashi et al. 2016). Depending on the position of the foreign body in the lower respiratory tract, varying degrees of cough, dyspnoea, anxiety, lack of appetite and cyanosis are observed (Tenwolde et al. 2010). In one study, an unusual case of the aspiration of a beetle was reported but the tracheal foreign bodies found in cats and dogs most frequently include needles, pieces of wood, grass, teeth, pebbles, bones, endotracheal tube pieces and lead (Zambelli 2006; Agudelo et al. 2018). In a study performed on 12 cats, the radiography revealed that the foreign body consisted of small pieces of rock in six of the eight subjects where opacity was observed; in the remaining cats, the foreign bodies consisted of bone and tooth pieces (Tivers and Moore 2006). As they can cause potential complications ranging from mild shortness of breath to severe respiratory tract obstruction and laceration, such foreign bodies need to be removed immediately and effectively because tracheal foreign bodies can be life-threatening (Zambelli 2006). Surgical intervention is an option that aims to treat dyspnoea immediately after diagnosis (Goodnight et al. 2010). While most tracheal foreign bodies in cats are detected in the carina region of the trachea (tracheal carnia), smaller foreign bodies may move even more distally. It is possible that foreign bodies like plants, weeds and pieces of wood may enter the upper respiratory tract or the nasopharynx secondarily, by attempts at vomiting the material out from the gastrointestinal tract (Hayashi et al. 2016). Non-surgical and effective methods have been defined for removing all types of tracheal foreign bodies. These may include rigid or flexible bronchoscopy, combined usage of wire-guided balloon catheter and fluoroscopy, removal of the foreign body by application of vacuum or by forceps under fluoroscopy (Levitt et al. 1993; Goodnight et al. 2010; Nutt et al. 2014).

Case report

A five-year-old, mixed-breed, neutered male cat weighing 5.7 kg was referred to the hospital with

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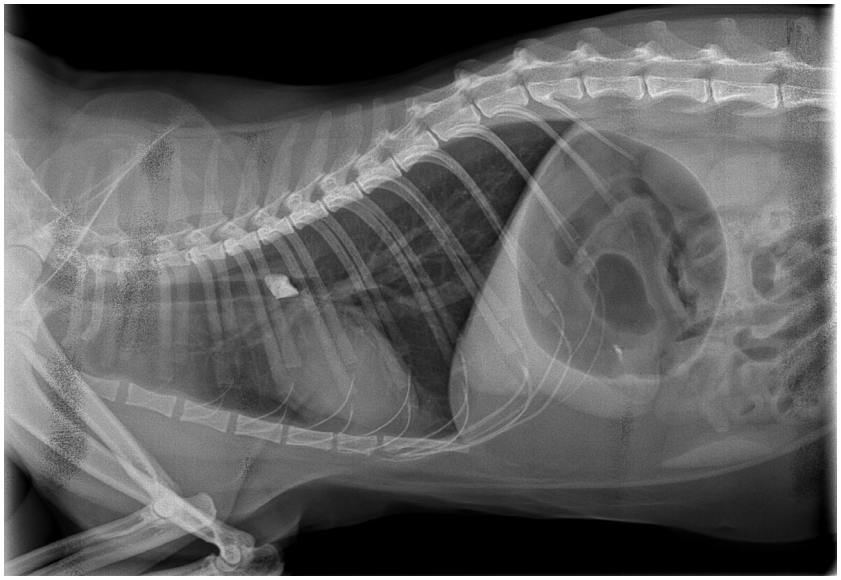

Figure 1. Mediolateral radiographic view of a five-year-old, mixed-breed, neutered male cat showing the presence of a radiopaque foreign body at the level of the carina trachea close to the basis of the heart. Gastric dilatation and gas pockets in the colon are visible and are probably due to aerophagia

complaints of dyspnoea, cough and lack of appetite. Anamnesis revealed that the subject was an outdoor cat, lost for four days and had been presenting with dyspnoea and lack of appetite for two days after it was found. Physical examination of the cat revealed open-mouth respiration, cough, severe anxiety, respiratory distress and cyanosis, and a heart rate of 130 bpm, body temperature of 38.2 °C and CRT of 2 s were recorded. Although the total leukocyte count showed an increase (27.6×10^9/l), the other results were found to be normal. The radiograph revealed a radiopaque foreign body (pebble) measuring 3 × 9 × 13 mm at the tracheal carnia causing obstruction in the tracheal lumen. Moreover, gastric dilatation and gas in the colon were also detected (Figures 1 and 2). A contrast X-ray was taken for differential diagnosis (5 ml/kg, iohexol-Omnipaque®) and demonstrated that the foreign body was located in the trachea (Figure 3). Considering the size, localisation and also length of time that the foreign body, which was causing severe dyspnoea and cyanosis, had been present, we decided to employ surgical removal. After premedication with meperidine (3 mg/kg), induction of general anaesthesia was achieved using intravenous Propofol at a dose of 4 mg/kg (Pofol®% 1, FreseniusKabi, Germany); the anaesthesia was maintained using a sevoflurane (Sevoflurane®, Eczacibasi-Baxter, Turkey) and oxygen mixture. Since the foreign body obstructed the tracheal lumen almost completely, the anaesthesia was maintained using continuous positive-pressure ventilation. Preoperative analgesia was achieved using tramadol hydrochloride (Tradolex® 4 mg/kg/8 h *i.v.*) and was applied until the fifth postoperative day. A skin incision was made at the level of the tuberculum costae from the fifth–sixth intercostal space, extending toward the sternum along the cor-

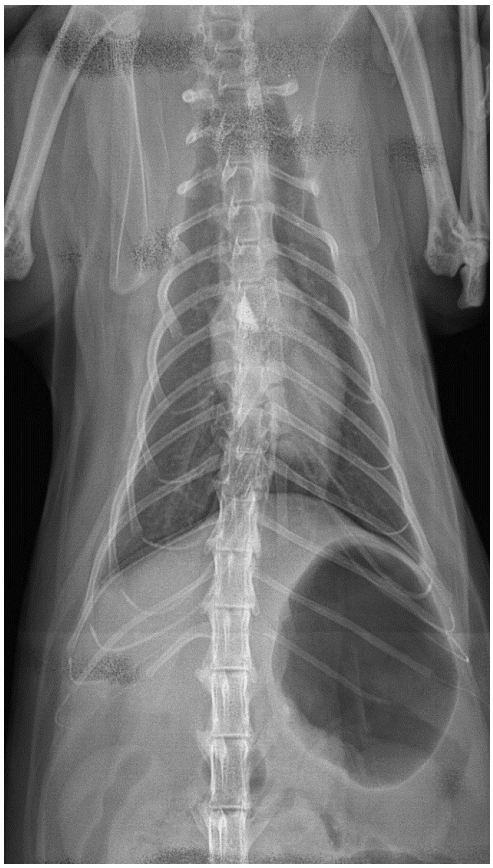

Figure 2. The radiopaque foreign body is also visible in the ventrodorsal radiographic view

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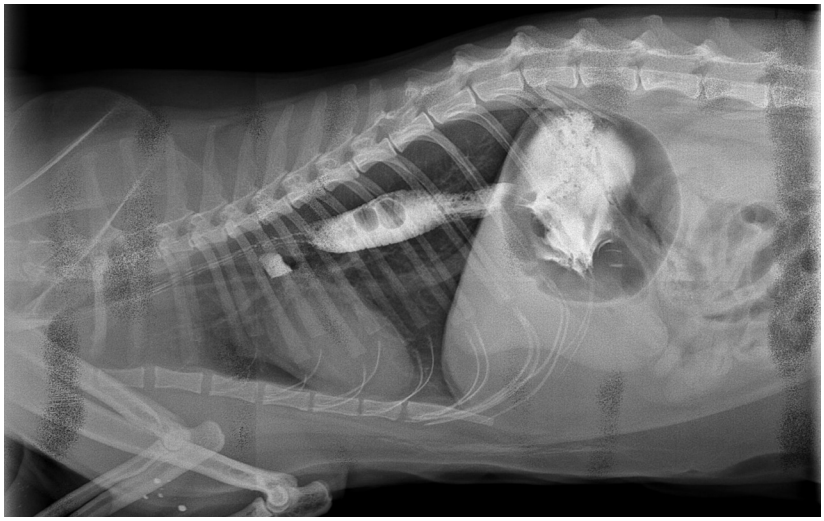

Figure 3. The oesophagus-stomach passage of radiocontrast agent that was used for differential and definitive diagnosis

pus costae. Following skin incision and after transection of the musculus latissimus dorsi, musculus serratus ventralis and musculus intercostales separately; retraction of the costae was accomplished using a Balfour retractor (Yoon et al. 2014). The foreign body was detected in the carina region. Annular ligament was incised in a direction parallel to the tracheal rings over the foreign body. The foreign object (Figure 4) was removed using haemostatic forceps. As continuous positive-pressure ventilation was sustained, the incised region in the trachea was immediately closed by simple interrupted sutures using 4-0 polypropylene (Propilen, Dogtas) and thereby, ventilation was maintained normally. After apposition of the costae, the muscles, the subcutaneous connective tissue and the skin were closed normally using 3-0 polyglycolic acid (Pegelak, Dogasan) and 3-0 polypropylene (Propilen, Dogtas), respectively. A thoracostomy tube was placed in the thoracic space to obtain negative pressure. The tracheal lumen did not show any narrowing, and no postoperative complications like pneumothorax, atelectasis, bronchospasm or subcutaneous emphysema were observed. The subject was discharged on the sixth postoperative day. No complications were observed during the long-term follow-up radiography of the cat at the fifth postoperative month (Figure 5).

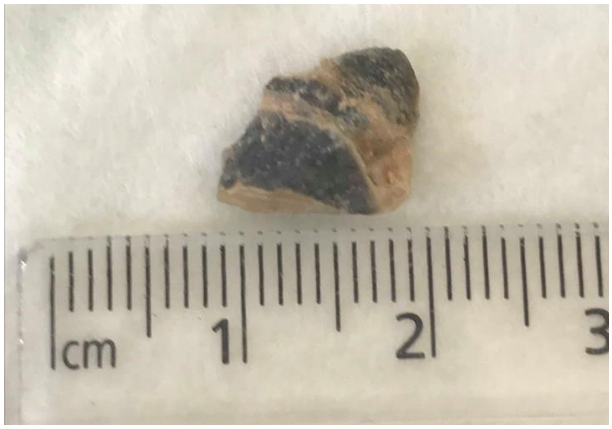

Figure 4. Foreign body (pebble) after removal

DISCUSSION AND CONCLUSIONS

Tracheal foreign bodies are emergencies that rarely occur in cats and dogs, but once present, they pose a potential threat to their lives. Early diagnosis, immediate assessment of the reason for respiratory distress and treatment are important for obtaining positive outcomes (Tivers and Moore 2006). As tracheal foreign bodies are rare in cats, in the present study we decided to confirm the diagnosis before surgery (to determine whether the foreign body was located in the trachea or oesophagus) using contrast X-ray. It is assumed that minimally invasive techniques decrease recovery time, minimise complications and may have financial advantages for the owner as well; however, surgical intervention is the best option for some conditions (Goodnight et al. 2010) and, if less invasive methods fail, surgical intervention may be preferred (Nutt et al. 2014). It was reported that complications like pneumomediastinum, subcutaneous emphysema, dyspnoea unresponsive to oxygenation and cyanosis may arise after bronchoscopy (Zambelli 2006). Endoscopic removal of the tracheal foreign body

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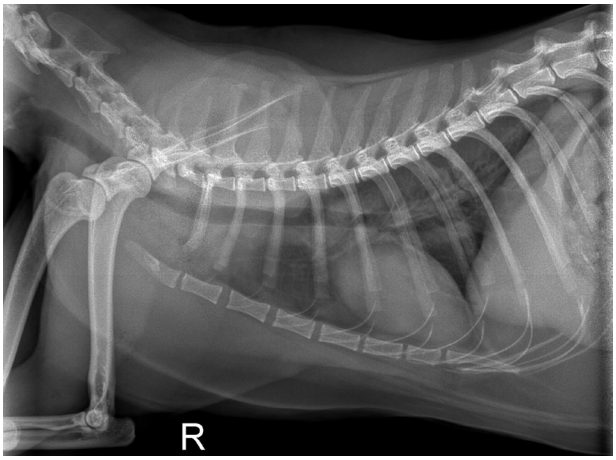

Figure 5. In the fifth postoperative month radiography, the trachea, the lungs and the thoracic cavity have a normal appearance in a way that supports the clinical picture. The owner confirmed that the cat regained its normal health status within a short period of time

is one reason for the occurrence of pneumomediastinum in cats. Other reasons include trauma and positive- or non-positive-pressure ventilation after endotracheal intubation (Thomas and Syring 2013). In another study, the authors attempted to remove the foreign body (pebble) endoscopically; however, as a result of a failed intervention lasting for 45 min, the cat was extubated and re-intubated twice resulting in the development of bradypnoea (respiration rate decreased from 24 to six breaths/min) and laryngeal oedema in the subject. In the same study, the authors tried to remove it by aspiration and failed again; in addition, an attempt at removing the foreign body using custom-made forceps under fluoroscopy failed due to the size of the object and its sharp corners. It was also reported that a strategy of removing the foreign body using pulmonary lobectomy, by pushing it toward the bronchia through the carina region could not be applied as the object was too large (5 × 6.5 × 7.5 mm) and there was a possibility of tracheal trauma (Goodnight et al. 2010). The study failed to explain why the authors did not assess intercostal thoracotomy or tracheotomy before planning pulmonary lobectomy. Finally, a wire-guided balloon catheter was passed by the foreign body, inflated at the other end, advanced toward the larynx and the body was then removed using alligator forceps (Goodnight et al. 2010). No information was provided on how ventilation was maintained in the tracheal lumen when the balloon catheter, which did not obstruct ventilation when its initial diameter was 1.7 mm, reached a diameter of 5–6 mm after being inflated; the time required to pull the foreign body toward the larynx was also not specified. After all, it is to be expected that the catheter would make respiration much more difficult as it covers the tracheal lumen almost completely after inflation. Additionally, the study provided little information on the time spent testing the other options in an attempt to remove the foreign body after failed bronchoscopy or the total time required for final removal of the object. In the present case, the authors decided to employ surgical treatment without trying bronchoscopy or other techniques mentioned above. This decision was made with respect to the urgency of the condition as dictated by the clinical picture of the subject: the foreign body was large enough to cover the lumen and even deform the tracheal wall outwards. The foreign body was removed without any complications in a considerably short time (approximately 45 min). In another study performed on a total of 37 cats and dogs (32 dogs and five cats), the foreign bodies (small pieces of branches) in two cats were completely removed using bronchoscopy, while in the other two cases, the foreign bodies (pieces of weeds) were removed only partly. The same study argued that the chances of successfully removing foreign bodies in smaller animals using bronchoscopy are low due to the narrow respiratory tracts of these animals. Similarly, in the present study, we also suggest that the occurrence of foreign bodies in the tracheal carina in cats is most frequently related to the fact that this region in cats is much narrower than in similarly-sized dogs (Tenwolde et al. 2010). Consequently, it should be kept in mind that the ideal method for removal of tracheal foreign bodies, which are rare in cats, may vary depending on the urgency of the case and particularly, on the characteristics of the foreign body. This case report aims to demonstrate in clinical practice that foreign bodies located in the distal regions of the trachea in cats obstruct these structures almost completely. Although believed to be an invasive method, an intercostal thoracotomy is an effective technique that provides for functional recovery in a short time, as long as the necessary conditions are met. Additionally, it may be a superior method to bronchoscopy in terms of the time spent under anaesthesia, complications that may arise due to repeated interventions such as tissue damage like tracheal rupture and lacera-

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tion and the occurrence of infections, bradypnoea and pneumomediastinum.

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