

Bronchoscopic removal of an aspirated vegetal foreign body in a small Münsterländer

Bronchoscopische verwijdering van geïnhaleerd vreemd plantenmateriaal bij een kleine münsterländer

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ABSTRACT

Foreign bodies are common in pets and may cause vague clinical signs. One of the locations a foreign body can be found is the bronchial region. The foreign body itself, but also secondary inflammation and infection can lead to severe tissue reactions. Bronchoscopy is a useful diagnostic imaging tool, due to its diagnostic ability and therapeutic possibilities to directly remove foreign bodies. In the present case, a small Münsterländer was presented with a one-week existing productive cough. The dog inhaled a wheat spike into the airways, subsequently causing the development of secondary inflammation and infection. Through bronchoscopy, the foreign body was located in the left mainstem bronchus and removed successfully with a special forceps.

SAMENVATTING

Vreemde voorwerpen in het lichaam van huisdieren komen regelmatig voor. Een van de locaties waar vreemde voorwerpen zich kunnen bevinden, is in de bronchiale regio. Het vreemd voorwerp op zich, maar ook de secundaire inflammatie en infectie kunnen grote weefselreacties veroorzaken. Bronchoscopie is een waardevolle techniek voor het detecteren van een potentieel vreemd voorwerp en laat tevens directe verwijdering van het voorwerp toe indien mogelijk. In dit artikel wordt een casus beschreven over een kleine münsterländer met klachten van een één week durende, productieve hoest. De hond had een tarwehalm geïnhaleerd ter hoogte van de luchtwegen met vervolgens het ontstaan van secundaire lokale inflammatie en infectie. Via bronchoscopie werd het vreemd voorwerp gelokaliseerd in de linker hoofdbronchus en vervolgens met een biopsietang succesvol verwijderd.

INTRODUCTION

One of the causes of the development of lung disease in dogs is the inhalation of foreign bodies. Often, these are plant materials, mostly seen with seasonal incidence (spring and summer) (Schultz and Zwingenberger, 2008; Tenwolde et al., 2010; Cerquetella et al., 2013; Marchesi et al., 2018; Flageollet et al., 2023). Most of these dogs fall into the hunting or working dog category, given their sniffing nature (Schultz and Zwingenberger, 2008; Cerquetella et al., 2013; Marchesi et al., 2018; Flageollet et al., 2023). In several cases, vegetal foreign bodies (VFBs) migrate from the nose or mouth to the deeper airways. During

its movement, a VFB can cause severe tissue reaction, such as severe inflammatory reaction and secondary infection, leading to abscess formation, pyothorax, pneumothorax and even sepsis, depending on the type of foreign material aspirated (Tenwolde et al., 2010). Further migration through pulmonary parenchyma to other parts of the body is often seen (Freundin et al., 1999; Cerquetella et al., 2013; Marchesi et al., 2018). A VFB needs to be firstly detected through a possible combination of diagnostics, whereafter it can be removed through endoscopy or surgical intervention. If a VFB is not detected and remains in place, chronic problems can arise with similar clinical signs, such as a bone sequester, neoplasia or other types of reaction

leading to remarkable granulomas or abscess formation with intermittently draining sinus tracts (Staudt et al., 2004). In the present report, the diagnosis and successful bronchoscopic removal of a VFB are described.

CASE

Signalment, history and clinical findings

A one-year-old, male, intact small Münsterländer dog was presented with a one-week history of coughing, which gradually increased in productivity. After playing in the fields, he developed acute respiratory distress. The owner brought him to a nearby clinic. General physical examination and pharyngeal inspection, without sedatives, were unremarkable. He was hospitalized for one day and discharged on doxycycline (Ronaxan®, Boehringer Ingelheim Animal Health, Belgium) 10 mg/kg once daily per os, for eight days. On top of the antibiotics, the dog also received an anti-parasitic treatment, which contained milbemycine oxime and praziquantel (Milbactor®, Ceva, Belgium 12.5mg/125mg), against a possible infection with parasites in the thoracic cavity.

The treatment described was unsuccessful, and nine days after the first presentation, the dog was presented at the referral clinic for further investigation.

Again, general physical examination was unremarkable. The dog was coughing loudly with a clearly audible mucus production. No abnormalities were heard on auscultation of the thorax. The main differential diagnoses were the presence of a foreign body, infection or inflammation. Neoplasia was considered less likely due to the acute onset of the clinical signs and the young age of the dog.

Medical imaging

Radiographs (X-Ray Verachtert Digital, Antwerp, Belgium) were taken under general anesthesia. The dog was premedicated intramuscularly (IM) with a combination of medetomidine 0.01 mg/kg (Sedator 1mg/ml, Dechra, the Netherlands) and methadon 0.1 mg/kg (Comfortan 10mg/ml, Dechra, the Netherlands). Anesthesia was induced with propofol 3 mg/kg intravenously (IV) (PropoVet Multidose 10 mg/ml, Zoetis, Belgium). Routine radiographic views were obtained in right lateral and ventrodorsal positioning (Figure 1). The lateral view revealed a very subtle radiopacity at the level of the air-filled trachea (arrow), which was suggestive for an intratracheal foreign body. The ventrodorsal view revealed a very subtle, localized interstitial pattern around the left mainstem bronchus. No left lateral view was taken, since both views taken already revealed an abnormality. It was thus decided to immediately undertake a bronchoscopy after the two obtained views.

After taking radiographs, anesthesia was maintained through continuous infusion of propofol. Through the use of a flexible bronchoscope (BF-1T160, Olympus), a foreign body was revealed. It was located in the left mainstem bronchus with purulent exudate cranially of the foreign body and mild inflammation on the surface of the bronchus (Figure 2). No tissue reactions on other locations were observed. At initial observation, a small foreign body was suspected, as big as what

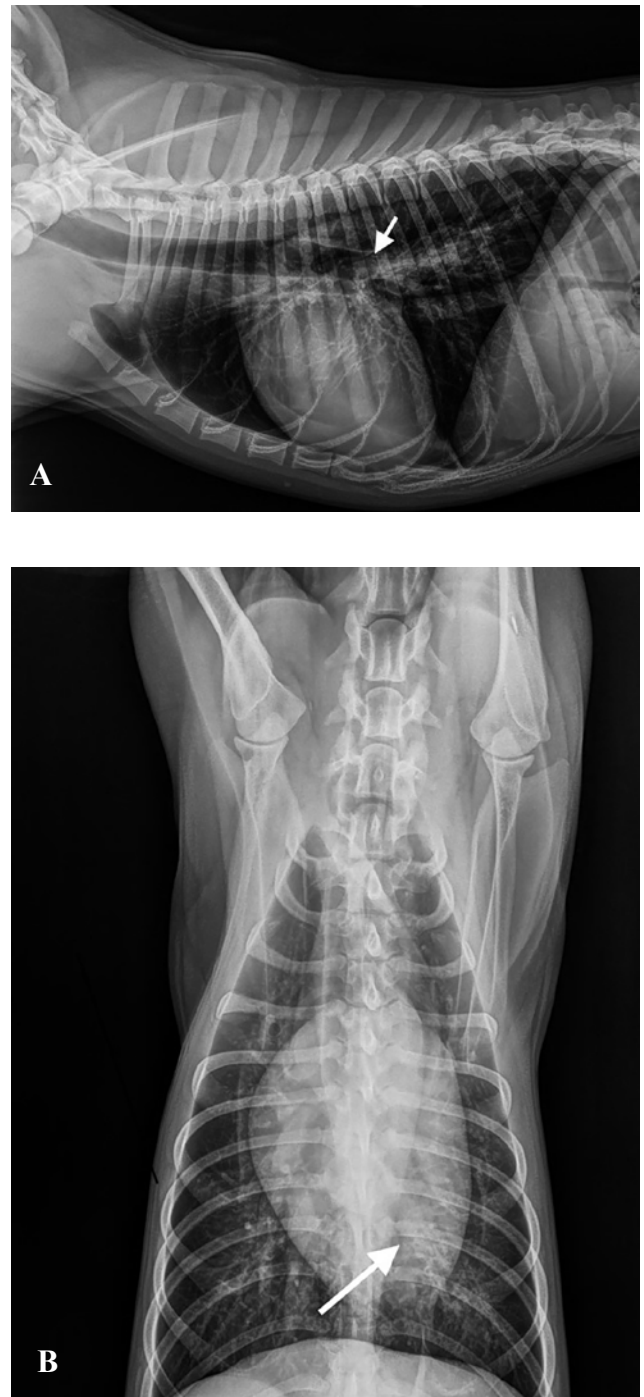


Figure 1. A. Lateral and B. Ventrodorsal radiographic projections of the thoracic cavity. The lateral view reveals a subtle radiopacity at the hilar region (arrow) of the air-filled trachea. The ventrodorsal view reveals a subtle local interstitial pattern (arrow).

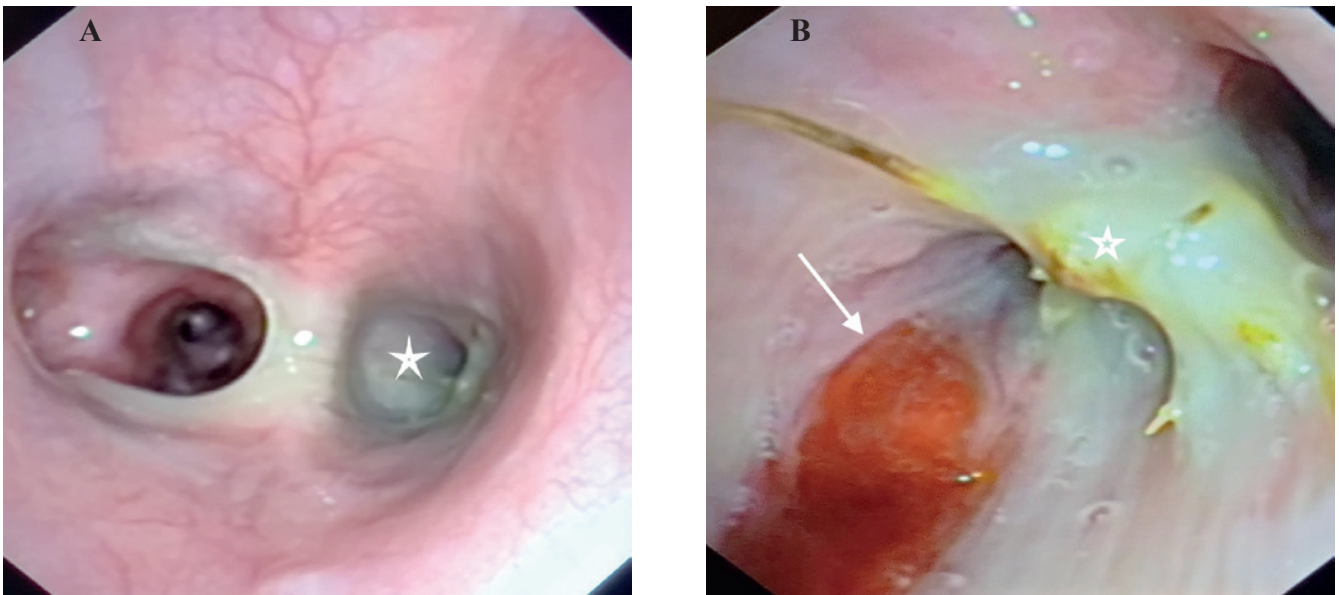


Figure 2. A. Intrabronchial image of purulent secretion (asterix) in the left bronchus. B. A foreign body with purulent secretion (asterix) and inflammation (arrow) on the surface of the bronchus.

could be seen. An attempt was made to get a good grip on the foreign material with a biopsy forceps (FB-25K-1, Olympus), in order to remove it carefully from the bronchus. Initially, the attempts resulted in the removal of small fragments of plant material. Eventually, the whole body was grasped by the forceps and carefully and progressively moved towards the mouth. The foreign body turned out to be much larger than initially expected. The findings were consistent with an inhaled foreign body representing a wheat spike (Figure 3).

Laboratory findings

As the bronchoscopy showed purulent secretion, a sample was obtained using a swab (Disposable Cytology Brushes, Fendo Medizin Technik, Germany), from the local exudate in the bronchus, and sent to the external laboratory (Algemeen Medisch Laboratorium, A.M.L., Antwerp) for bacteriological culture and sensitivity testing. No pathogens were found on culture.

Recovery

No anesthetic complications occurred during the procedure and the patient made an uneventful recovery from anesthesia. After the removal of the foreign body, the course of antibiotics was resumed and given ten days in total, two days extra after the procedure. This was done pending the bacterial culture and sensitivity test. Non-steroid-anti-inflammatory-drugs (Metacam 1,5mg/ml®, Boehringer Ingelheim Animal Health, Belgium, 0.1mg/kg) were given orally once daily for three days after bronchoscopy. The dog's cough had disappeared a few days after the bronchoscopic procedure.



Figure 3. Inhaled foreign body representing a wheat spike.

DISCUSSION

One of the clinical signs of a patient with a bronchial VFB can be an acute onset of coughing or respiratory distress (Tenwolde et al., 2010; Marchesi et al., 2018; Flageollet et al., 2023). The duration of clinical signs can range from one day to more than three years, with a median of one month before diagnosis (Flageollet et al., 2023). Cough is an important defense mechanism in an animal to try to remove the initiating cause of the coughing. Bronchoconstriction and mucus secretion are additional defense mechanisms, when the cause cannot be removed immediately by coughing. A balance between the formation of a thin blanket of airway mucus and the clearance of excessive mucus is an important tool in trapping and removing impurities. Compromising this balance with the production of excessive mucus, as in the presence of a foreign body, can impair the mucociliary clearance and can, in addition, facilitate the development of upper or lower respiratory tract diseases (Farzan, 1990). Persistence of the cause of the pathological condition can develop chronic diseases, such as abscess or granuloma formation (Frendin et al., 1999; Marchesi et al., 2018).

In the present case, the VFB was found in the left mainstem bronchus. In a study of Tenwolde et al. (2010), radiographic assessment of foreign body location was incorrect in 33% of the cases, with main findings of generalized interstitial or bronchial pattern with no localized features. The very subtle signs in the radiographs in the present case could lead to the differential diagnosis of a foreign body in the left bronchial region but could not be used as a certainty. Cerquetella et al. (2013) and Tenwolde et al. (2010) described the frequency of the location in which foreign bodies were found. In both studies, it was confirmed that the presence of a foreign body in a right-sided bronchus is more frequent than in a left-sided bronchus, meaning that VFBs are more frequently found in the right-sided lung lobes than in the left-sided. This finding is also confirmed in a study of Flageollet et al. (2023). It could be explained by the anatomical characteristics of the canine right principal bronchus that is straighter than the left bronchus at the level of the carina, making it easier for inhaled foreign bodies to migrate in the direction of the right lung (Eom et al., 2006; Cerquetella et al., 2013; Marchesi et al., 2018; Flageollet et al., 2023) (Figure 4).

Several bronchial VFBs, even up to ten, can sometimes be found in one patient, but this is not often seen (Tenwolde et al., 2010; Cerquetella et al., 2013; Marchesi et al., 2018; Flageollet et al., 2023). A complete examination of the airways is therefore needed when performing a bronchoscopy (Flageollet et al., 2023).

In this case report, it is shown that non-invasive techniques can be used in diagnosing and even in the removal of foreign bodies situated in the upper and lower airways. Radiography, ultrasonography, com-

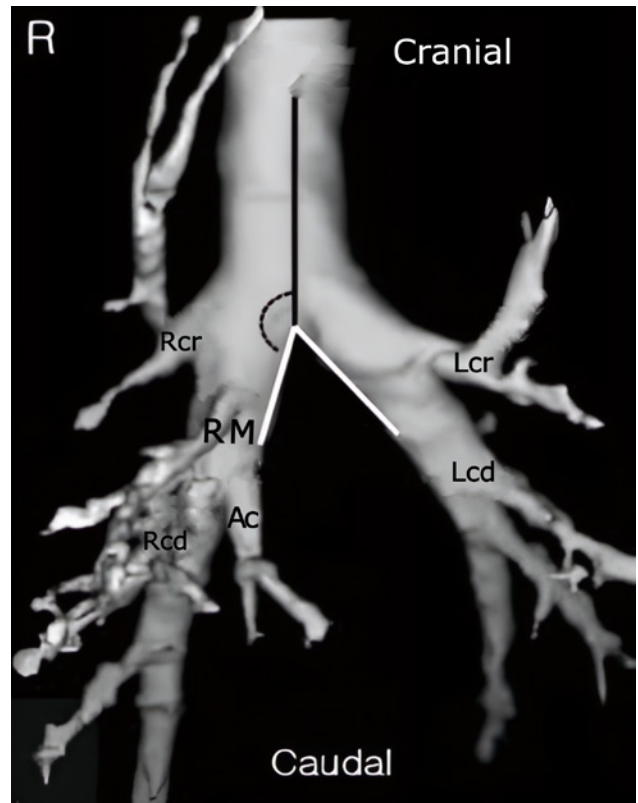


Figure 4. Ventral aspect view of 3D reconstruction CT images of a dog's lungs. The angle (black dotted curved line), measured between the principal bronchial (white line) and tracheal extension (black line) is greater on the right side (including the right cranial (Rcr), middle (Rm), caudal (Rcd) and accessory (Ac) lobar bronchi) than on the left side (including the cranial (Lcr) and caudal (Lcd) lobar bronchi).

puted tomography, magnetic resonance imaging and endoscopy are used in cases like this, with the last mentioned being the most interesting, due to its non-invasive diagnostic ability in combination with the possibility of direct removal of potential foreign bodies (Schultz and Zwingenberger, 2008; Cerquetella et al., 2013). Bronchoscopy permits good visualization of the upper airways and mainstem bifurcation.

Besides the successful use of bronchoscopy, there can be complications using this procedure. The most common complications are mild bleeding during and after the procedure, unsuccessful removal of the bronchial VFB, the development of nodules on the mucosal surface preventing the extraction of the VFB, the localization (too deep or in a too narrow space), and the possibility of a misdiagnosis, with the absence of a foreign body (Flageollet et al., 2023).

No bacterial growth on bacterial culture was seen in the present case. The authors believe that the lack of growth of bacteria was due to the antibiotic treatment at the time of sampling. However, in the study of Tenwolde et al. (2010), bacterial growth was detected in several cases, even with an ongoing antibacterial treatment, with aerobic species the most isolated, followed

by anaerobic species and *Mycoplasma*. One limitation in the present study is that the sample was not submitted for either *Mycoplasma* cultures, or mycological cultures. The authors support however the clinical importance of performing aerobic, anaerobic, and *Mycoplasma* cultures and mycological cultures in dogs with the presence of a bronchial VFB (Tenwolde et al., 2010; Flisi et al., 2018).

The most frequently isolated microorganism in the upper respiratory tract is *Staphylococcus* sp., while in the lower respiratory tract *E. Coli* is the most frequently isolated microorganism (Flisi et al., 2018), with the latter being the most clinically relevant in the present case. According to the study of Flisi et al. (2018), the majority of aerobic bacterial microorganisms are susceptible to the treatment of fluoroquinolones and doxycyclines.

According to the antimicrobial use guidelines for treatment of respiratory tract diseases in cats and dogs (Lappin et al., 2017), the empirical administration of doxycycline for 7-10 days (5 mg/kg PO, q12h, or 10 mg/kg PO, q24h) is recommended. According to the same guidelines, a bacterial culture is not necessary once the clinical symptoms are resolved. These recommendations have been followed in the present case.

CONCLUSION

An acute onset of coughing, with no response to medication, including antibiotics, and with progressive deterioration, can be a symptom of a foreign body in the airways. Endoscopic removal of the foreign body can be curative.

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