CASE REPORT

Influence of obesity on the clinical improvement of tracheal and bronchial collapse in dogs: a case report

Influência da obesidade na melhora clínica do colapso de traqueia e brônquio em cão - relato de caso

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Abstract

Tracheal collapse is the most common progressive affection of the anterior pathways in small animals. The most common clinical symptom is a "goose honk" cough in cases of tracheal collapse and inspiratory discomfort in cases of cervical collapse. The diagnosis is based on the history, physical examination, and imaging tests, notably chest radiography and endoscopic examination. Treatment can be clinical or surgical depending on the degree of collapse. Obesity currently affects several domestic animals and predisposes them to respiratory disorders. The overlapping adipose tissue presses on the muscles of the trachea, aggravating the collapse and influencing the lung compliance and expansion. The present report describes the clinical improvement in an obese canine with tracheal and bronchial collapse after clinical management and therapeutic ration.

Keywords: airway diseases, clinical management, obesity, dogs.

Resumo

O colapso de traqueia é a afecção mais comum das vias anteriores de pequenos animais, de caráter progressivo. O sinal clínico mais comum é a tosse de "grasnar de ganso" e o desconforto inspiratório, nos casos de colapso cervical. O diagnóstico baseia-se no histórico, exame físico e exames de imagem como radiografia torácica e exame endoscópico. O tratamento pode ser clínico ou cirúrgico mediante o grau do colapso. A obesidade, atualmente acomete muito animais domésticos, influenciando nas afecções respiratórias. A sobreposição de tecido adiposo exerce pressão na musculatura da traqueia agravando o colapso, bem como exerce influência na complacência e expansão pulmonar. O presente estudo tem por objetivo avaliar a melhora clínica de um paciente com colapso de traquéia e brônquio, com obesidade, após o manejo clínico e ração terapêutica.

Palavras-chave: doenças das vias aéreas, manejo clínico, obesidade, cães.

Introduction

Anterior and posterior respiratory tract affections are usually because of a reduction in the lumen due to obstructive airway diseases that cause varying degrees of obstructions in the air passage inside the respiratory system. Depending on the site of involvement (anterior and / or posterior airways), different types of respiratory discomfort are related to isolated or concomitant clinical signs such as coughing, snoring, and wheezing and striders on auscultation (Gough, 2009).

Tracheal collapse is one of the main diseases of the respiratory tract that affect small dogs. It is characterized by a laxity of the tracheal dorsal musculature, resulting in different degrees

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of collapse. Based on the percentage of reduction in the tracheal lumen, they include: grade I, 25% reduction; grade II, 50%; grade III, 75%; and, grade IV, above 75% (Creevy, 2009). Likewise, bronchial collapse may be caused by muscle laxity, but its degrees are not described in the literature (Herrtage, 2009).

The main clinical signs include "goose honk" cough, cyanosis, and dyspnea. When the cervical portion is affected, the dyspnea is inspiratory; the dyspnea is expiratory when the thoracic portion is involved (both the trachea and bronchi) (Maggiore, 2014).

The diagnostic examination of choice is inspiratory and expiratory thoracic (right ventro-dorsal, right lateral-left, and left lateral-lateral) and cervical (lateral-lateral) radiography. This is less invasive and cheaper than endoscopy and is the gold standard for the diagnosis and classification of the degrees of collapse (Padrid, 2011).

The use of a lamp, close to the cervical ventral region at the time of the chest radiography, stimulates the collapse and favors the visualization of tracheal light narrowing on radiography (Lindl Bylicki et al., 2015).

In visualizing the bronchial collapse, the radiographic positioning should be in the right and / or left side-to-side view, so that the evaluated region allows the visualization of the entire rib cage; triggering caused by the radiographic device occurs at the time of expiration, because of the reduction in the bronchial lumen (Maggiore, 2014).

The treatment depends on the degree of collapse and the indication of treatment. It could be clinical-conservative in milder cases or surgical with the placement of extraluminal or intraluminal prosthesis in the most severe cases(Becker et al., 2012). Likewise, the prognosis can be targeted according to the different grades of collapse (grade I to IV), being favorable in cases where the percentage of reduction in the tracheal lumen is more discrete (Herrtage, 2009).

In cases of bronchial collapse, the treatment depends on the degree of involvement and the control of triggering factors such as overweight, treatment of possible intra-thoracic masses, and foreign bodies, all of which compress the bronchus and reduce its lumen (Becker et al., 2012).

Obesity is the main metabolic disease in domestic animals because of their feeding habits with a wide diversification of more caloric and palatable foods (Batistela & Domingues, 2005; Jericó et al., 2014).

Obesity can influence the lung compliance and expansion, causing a greater respiratory effort and reduction in the renewal of residual air due to the ineffective ventilation of certain pulmonary areas (Laflamme, 2006; Malik et al., 1996). In companion animals, the most affected lobes are the cranial and accessory lobes due to their anatomical location. Airflow is reduced in these regions, leading to hypoventilation and low residual air renewal, increasing the likelihood of infectious and inflammatory diseases and reducing gas exchange at the alveoli leading to hypoxia (Kleiger et al., 2005).

The literature on the effects of canine obesity on airway diseases is still scarce. Therefore, it is essential to understand the effects of the pathophysiological mechanisms of obesity on the cardiorespiratory system in dogs and reinforce the importance of treating obesity.

The present case report describes the clinical improvement in an 11-year-old Shih-Tzu canine, diagnosed with tracheal and bronchial collapse, after clinical management and the establishment of a specific weight loss program.

Case report

We obtained authorization through a signed informed consent form from the patient's owner for dissemination of the case details for academic and scientific purposes.

In November 2017, at the Cardiology Service of the Veterinary Hospital of the Federal Rural University of Rio de Janeiro, a canine, Shih-Tzu (11 years old, 7.7 kg), was brought for coughing for at least five months. According to the tutor, the cough was loud and occurred throughout the day, both during agitation and at rest. On physical examination, the patient was overweight (body score 8/9) on the LAFLAMME morphometric scale (1997). The cough reflex present was quantified as highly intense and persistent (5+). During the inspection of the oral cavity, slight cyanosis of the tongue was seen; pulmonary auscultation revealed increased inspiratory and

expiratory sounds. The other vital parameters were within the normal range recommended for the species.

In view of the findings, a collapse of the trachea was suspected, and chest (ventro-dorsal, right-lateral-left, and left-lateral-left) and cervical (lateral-lateral) radiography was performed during inspiration and expiration. Hematological examination including analysis of the red and white series and platelet analysis and serum biochemical measurements did not show any alteration. The radiographic examination showed a reduction in the diameter of the cervical and thoracic trachea and the main bronchus (Figures 1-4). Aminophylline (10mg / kg / BID for 30 days) and nebulization with beclomethasone dipropionate (400mcg), were prescribed, diluting half a flacon of the drug in 4 ml of saline solution (NaCl 0.9%), BID, for another week and, later, SID for another week. We also proposed a ration for weight reduction.

The patient returned for review in 15 days with improvement in the condition. There were reports of sporadic coughs during exercise. On physical examination, a low-intensity persistent cough reflex (2+) and a slightly increased expiratory noise on pulmonary auscultation were observed. Other parameters were within the normal range. Aminophylline was maintained until 30 days were completed. Two weeks later, the dog was admitted to the emergency department of the Veterinary Hospital of the Federal Rural University of Rio de Janeiro for cyanosis and inspiratory obstructive dyspnea. The condition was stabilized with oxygen therapy and nebulization in a mask with beclomethasone dipropionate and hydrocortisone (5mg/kg/IV). Because of symptom recurrence, doxycycline (10mg/kg/SID) was prescribed; prednisone (0,5mg/kg/BID) was given for 7 days every 12 hours; after weaning, the same dose was administered for another 7 days every 24 hours and then another 7 days every 48 hours. Salmeterol xinafoate associated with fluticasone propionate spray (25mcg/250 mcg BID) was also started until further recommendations.

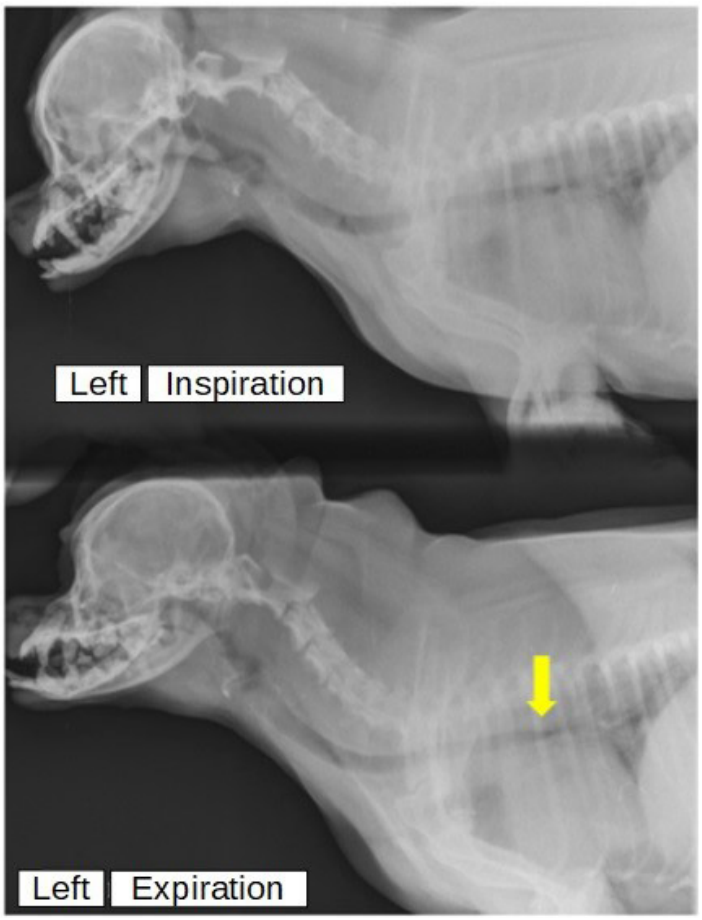

Figure 1. Left lateral-lateral cervical radiographic image showing a reduction in the diameter of the bronchus - bronchial collapse on expiration (arrow).

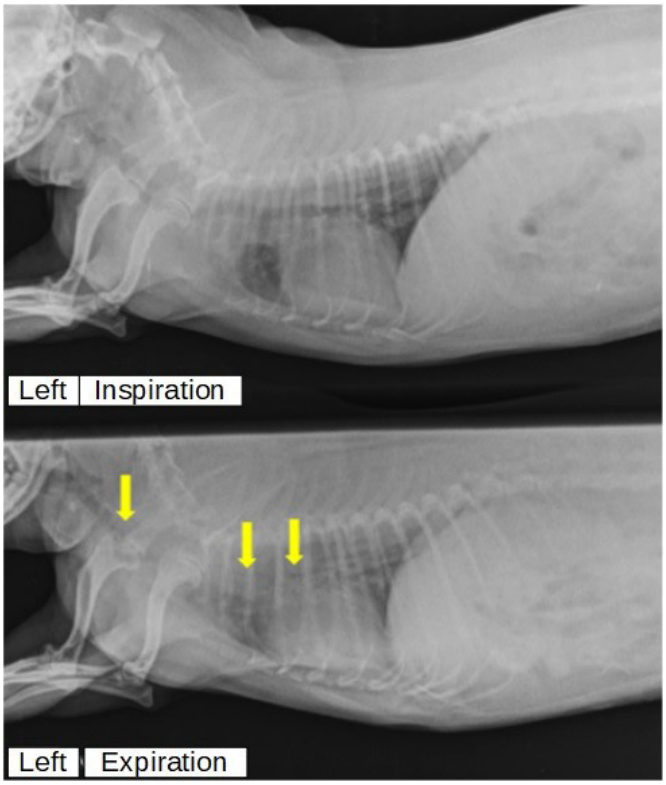

Figure 2. Left lateral-left cervical-thoracic radiographic image showing a reduction in the diameter of the cervical trachea, thoracic trachea, and bronchus (arrows).

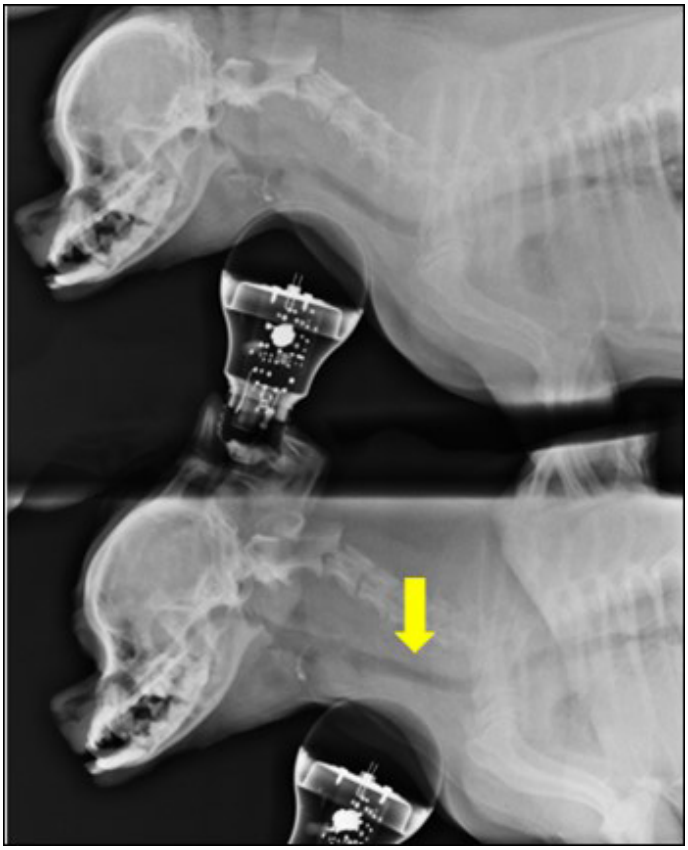

Figure 3. Cervical radiographic image showing a reduction in the diameter of the cervical trachea (arrow) after a compression test with a lamp.

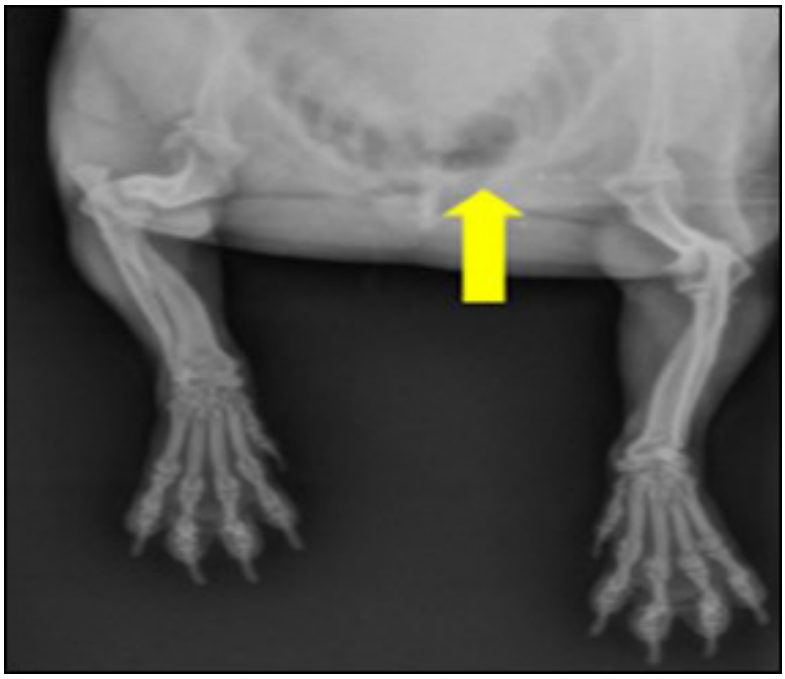

Figure 4. Tangential cranio-caudal radiographic image of the chest entrance showing a reduction in the diameter of the trachea (arrow)

For 3 months after diagnosis, the patient returned a few times for an emergency and a recurrence of respiratory distress and cyanosis, and the emergency protocol described above was recommended. Although we always oriented the weight control program, the tutor was not fully implementing it. Upon insisting, the tutor decided to consistently adhere to it.

After 3 months of therapeutic ration for weight loss, the dog no longer showed clinical signs for about 2 months and had significantly lost weight, with a total loss of 1.9 kg of the initial weight (7.7 kg), weighing 5.8 kg.

Currently, 2 years after the beginning of the treatment, the patient continues to be monitored on strict control for weight maintenance and presents sporadic cough during physical activity.

Discussion

Based on the history of the "goose honk" cough, which is a characteristic of the disease (Maggiore, 2014); the physical examination with a cough reflex triggering the paroxysmal cough revealing a tracheal sensitivity; and radiographic examinations with a reduction in the diameter of the trachea and bronchus, the diagnosis of tracheal and bronchial collapse was possible in the present case (Atkins, 1999). Coughing is a consequence of tracheal and bronchial collapse resulting from respiratory effort, raising intrathoracic pressure and damaging the mucosa through contact of the epithelial linings, which inflames the airways and stimulates the cough receptors (Hawkins, 2009).

The greatest effort in inspiration and expiration is the passage of air due to airway obstruction that occurs in the condition. This is represented clinically by an increase in inspiratory lung sounds and inspiratory dyspnea (Nelson, 2007). These findings are related to a reduction in oxygen saturation at the alveolar level and, thus, corroborate with the cyanosis observed in the patient. This low oxygen perfusion in hemoglobin triggers the hyperpnea mechanisms, further exacerbating the noises (Rozanski, 2015).

Corticosteroid therapy aims to reduce tracheal and bronchial inflammation and is also effective in controlling cough (Hawkins, 2009). Use of the bronchodilator, aminophylline, resulted in the improvement of the mucociliary function, reducing the fatigue of the smooth muscle of the tracheobronchial tree and favoring the reestablishment of the distribution of oxygen inside the smaller airways. It also reduces bronchial spasms from recurrent inflammation (Alonso, 2007; Rozanski, 2015).

Doxycycline was introduced according to the chronicity of the case, as excessive cough associated with respiratory effort and consequent chronic inflammation lead to epithelial desquamation, making mucus removal difficult and causing a hyperplasia of the glands with greater production of secretions, predisposing to infections (Sun et al., 2008; Hawkins, 2009).

Weight loss was fundamental in the control of the clinical signs of tracheal and bronchial collapse, since the overlap of the adipose tissue in the dorsal muscles of the trachea associated with laxity favors collapse (Rajendra Acharya et al., 2006). White & Williams (1994) in their study showed the relationship between the predisposition and / or worsening of cases of tracheal collapse in dogs. Subsequently, it was found that the levels of partial pressure of oxygen increase with a reduction in obesity in dogs (Karason et al., 1999; Pelosi et al., 2013). Likewise, physical exercise after weight loss and maintenance of weight control help to alleviate and reverse some clinical signs, but they should be indicated with caution in animals with tracheal collapse, even after controlling the body weight and reducing clinical changes, because of increased respiratory capacity and oxygen demand that may cause greater irritability of the trachea due to the rapid passage of air (Karason et al., 1999; Farah et al., 2013; Pelosi et al., 2013).

The success of the treatment in a short period was evidenced by comparing the patient's body weight before and after the established period, which demonstrated a significant reduction (approximately 25% of the initial weight), without extrapolating the recommended limits for loss of healthy weight and without exposing the animal to the stress of the negative energy balance (Verkest, 2014).

Using the results achieved in the present report, it can be inferred that the imbalance in respiratory activity resulting from obesity in dogs is likely to be the same in humans. Furthermore, a greater understanding of this regulation in these animals is necessary, especially when considering their physiological parasympathetic activation, which influences and may worsen the collapse of the already weakened dorsal muscles of the trachea in most dogs (Goldberger, 1999).

Conclusion

In the present case, it was possible to perceive the importance of weight control in dogs with tracheal collapse, since periodic episodes became less frequent after weight loss.

Our findings demonstrate the influence of obesity on ventilatory and respiratory capacity; most importantly, the overlap of adipose tissue on the dorsal muscles of the trachea may have been responsible for the most damage and collapse.

Thus, weight control in domestic animals is increasingly important and is becoming a clinical routine, which often requires a simple handling of the amount of food offered and the removal of snacks.

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