Proceedings of the 35th World Small Animal Veterinary Congress

WSAVA 2010

Geneva, Switzerland - 2010

Next WSAVA Congress:

2011 WSAVA CONGRESS
14 -17 October, 2011 Jeju, KOREA

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INTRODUCTION
Diseases causing chronic non cardiac cough are common in dogs and include chronic bronchitis, eosinophilic bronchopneumopathy, idiopathic pulmonary fibrosis of terriers, recurrent bacterial bronchopneumonia related to chronic and repeated aspiration or to anatomic disorders such as primary ciliary dyskinesia, and others. A selection of these disorders will be discussed.

Chronic bronchitis

CHRONIC BRONCHITIS IN DOGS IS DEFINED WHEN 3 DIAGNOSTIC CRITERIA CAN BE FULFILLED
- CHRONIC COUGH
- EVIDENCE OF EXCESSIVE MUCUS OR OF MUCUS HYPERSECRETION
- EXCLUSION OF OTHER CHRONIC CARDIOPULMONARY DISEASES (EG CONGESTIVE HEART FAILURE, CHRONIC INFECTIOUS BRONCHOPNEUMONIA, PULMONARY NEOPLASIA, EOSINOPHILIC BRONCHOPNEUMOPATHY..)

Coexisting diseases (eg congestive heart failure and airway collapse) may be present and complicate the diagnosis and treatment. The causes of chronic bronchitis are poorly understood. The major difficulty is that the disease is detectable only in its advanced stages, since it has an insidious onset and lengthy pathogenesis.

Signalment
Chronic bronchitis is mostly seen in middle age to old smaller breeds of dogs, but can occur larger breeds.

Clinical signs and diagnosis
Diagnostic tests are performed to rule out other causes of chronic cough. CBC is usually normal. Thoracic radiographs show bronchial wall thickening or generalized increased airway-oriented interstitial density or both. Bronchoalveolar lavage (BAL) cytology typically reveals excess mucus with possibly hyperplasia of epithelial cells, and increased numbers of neutrophils, goblet cells and macrophages.

Management and monitoring
The bronchial alterations are not readily reversible, if at all. Therapy is based on an assessment of the nature and severity of the individual animal’s problems, and relies on client education. Basically, management includes
- avoidance of exacerbation factors (environment, exposure to inhaled irritants, harness rather than collar)
- control of body weight: this is very important in overweight dogs since a significant improvement in clinical signs is often seen with weight reduction alone
- relief of airway inflammation: anti-inflammatory therapy using low dose glucocorticosteroids, which are thought to reduce mucus hypersecretion and mucosal bronchial wall thickening. Bronchodilators (B2 agonists, theophyllin) are frequently used although their effectiveness in the treatment of chronic bronchitis has not been widely addressed.
- control of infection and dental hygiene

Eosinophilic bronchopneumopathy

Canine eosinophilic bronchopneumopathy (EBP) is a disease characterised by eosinophilic infiltration of lung parenchyma and bronchial mucosa likely resulting from immunological hypersensitivity. However, in many cases, no underlying cause is found. The exact role of inhaled allergens in EBP is still unclear.

Signalment
EBP is mostly diagnosed in young dogs. A predisposition for Siberian huskies exists but many breeds can be affected.

Clinical signs
Usually, the general condition is good, unless the disease is associated with concomitant bacterial bronchopneumonia.
Clinical signs include mainly coughing, gagging and retching which are present in 100% of the cases. Dyspnea is a very frequent sign. A less commonly encountered sign is nasal discharge (about 50% of the affected dogs).

Diagnosis
Diagnostic elements for the diagnosis of EBP include signalment and history (breed, young age, previous response to corticosteroids), clinical signs, radiographic and bronchoscopic findings, peripheral eosinophilia (in about 60% of the cases), tissue eosinophilic infiltration, and response to adequate treatment in the absence of other pathologies. Bronchoscopy can reveal typical macroscopic features such as presence of abundant yellow-green mucous or mucopurulent material, or severe thickening of the mucosa with irregular or polypoid surface. BAL or brush cytology show a marked eosinophilic component. In most cases, eosinophilic infiltration of the bronchial mucosa can also be observed in biopsies.

Treatment
The response to steroid therapy is generally very good, although complete remission may not always be achieved. Oral as well as aerosol therapy can be recommended. Relapses frequently occur within weeks to months after drug discontinuation although some dogs may remain asymptomatic after steroids have been weaned off.

PRIMARY CILIARY DYSKINESIA (PCD)
Primary ciliary dyskinesia (PCD) results from defective ciliary motility mostly associated with ultrastructural abnormalities. Ineffectiveness and incoordination of the ciliary function result in ineffective clearance of mucus from the airways, which in turn results in chronic mucus plugging and inflammation of nasal cavities and lower airways. Kartagener's syndrome represents a triad of signs that includes bronchiectasis, complete transposition of viscera (situs inversus) and chronic rhinosinusitis.

Signalment and clinical signs
As a consequence of impaired mucociliary clearance, the main clinical signs include chronic respiratory abnormalities such as rhinosinusitis, bronchitis, bronchopneumonia and bronchiectasis, and
typically begin at an early age. Finding the hallmark clinical features in combination with situs inversus is even more suggestive.

**Diagnosis.**

Confirmation of a diagnosis of PCD requires both in vivo and in vitro functional and ultrastructural analysis of cilia. Transmission electron microscopy can reveal specific ultrastructural abnormalities. However, the distinction between PCD and secondary ciliary defects (SCD) caused by another primary disease is difficult on the sole basis of ultrastructural findings.

**Management**

Even though PCD is not a curable disorder, it can frequently be managed for some years. A key element in this successful management is the adequate monitoring of infecting microorganisms and judicious use of antibiotics over time. Moreover a good systemic and local hydration together with daily coughage and vigorous exercise will help to clear mucus from the airways. However, long-term prognosis is poor. It would be very useful to have a genetic test able to identify carriers.

**CHRONIC IDIOPATHIC PULMONARY FIBROSIS (IPF) IN WEST HIGHLAND WHITE TERRIERS AND OTHER TERRIER BREEDS.**

Chronic idiopathic pulmonary fibrosis (IPF) in West Highland White Terriers and other terrier breeds (Cairn, Yorkshire, Bull or Staffordshire Terriers) is an emerging chronic and progressive pulmonary condition. It has been described mostly in middle to old-aged West Highland White Terriers, but also in other young- to middle-aged terrier breeds such as the Staffordshire Bull Terrier. The etiopathogenesis is not known, although a genetic predisposition is suspected.

**Clinical features**

This disease is clinically characterized by progressive dyspnea, exercise intolerance, and significant crackles on auscultation. Cough is described in most but not all animals and principally in the early phase of the disease. The condition is hard to distinguish from chronic bronchitis, which may be concomitant.

**Diagnosis**

Radiographic, bronchoscopic, hematological or biochemical findings are generally unremarkable and not specific. Confirmation of the diagnosis requires lung biopsy and histology, although CT scan looks promising as a less invasive method.

**Management and prognosis**

As the disease is a progressive condition, the long-term prognosis is poor. The clinical course is characterized by a slow progression together with episodes of worsening. So far, no therapy has been proven to be clearly beneficial.

**BRONCHIECTASIS**

Bronchiectasis is defined as an abnormal and permanent dilatation of subsegmental airways. The affected airways are usually partially obstructed by purulent or viscous exudates since the dilation greatly interferes with normal airway clearance. Focal bronchiectasis most often results from foreign body aspiration. Diffuse bronchiectasis often occurs subsequent to aspiration or inhalation injury, bordetellosis, primary ciliary dyskinesia or chronic bronchitis. Therapeutic considerations are the same as for chronic bronchitis, but the disease is more difficult to control although despite substantial clinical abnormalities, dogs with bronchiectasis may survive for years.

**Reference**