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Dyspnoea and Coughing in Small Animal Practice

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Coughing

A cough is an explosive release of air from the lungs through the mouth and is generally differentiated into productive or non-productive.

Define the system

Cardiac vs. respiratory disease

For the patient with a chronic cough the very first question that must be answered is whether the cough is due to primary respiratory or primary cardiac disease. This differentiation can often be difficult, but it is essential that all aspects of the history and physical examination be utilised to make this assessment. If the cough is due to respiratory disease, it can be further classified as being due to upper or lower respiratory tract disease.

Define the anatomical location

Non-productive coughing

Non-productive coughing has a harsh "hacking" sound, frequently occurs in paroxysms, and may be followed by retching. Non-productive coughing is generally associated with tracheal or large airway disease, usually inflammatory or dysplastic. Many of these disorders will not be associated with dyspnoea as it is difficult to significantly occlude the lumen of these relatively wide airways. There are two notable exceptions, however. One is tracheal hypoplasia, a congenital malformation of the trachea producing significant narrowing of the trachea and associated dyspnoea. The second is sterile bronchitis or "allergic" bronchitis. In cats in particular, inflammation of the airways due to various hypersensitivities produces inflammation and varying degrees of bronchospasm. The latter results in dyspnoea, which is usually expiratory.

Diagnostic procedures. Patients with non-productive coughing usually require various diagnostic steps to be performed to evaluate and characterise their dysfunction. Procedures that may be helpful include:

- Tracheoscopy/bronchoscopy.
- Transtracheal aspirate.
- Bronchial wash/bronchoalveolar lavage.
- Radiology/fluoroscopy.

Productive coughing and dyspnoea

Productive coughing sounds "moist" and results in mucus, exudate, oedema fluid, or blood from airways being delivered to the oral cavity. Usually the animals demonstrably swallow the material. Rarely, expectoration occurs and can be confused with vomiting. Productive coughing is most often associated with pulmonary parenchymal disease. Frequently these diseases will also produce dyspnoea or orthopnoea (positional dyspnoea). This is most notable on expiration or throughout inspiration and expiration. Any primary lung problem or cardiac abnormality that interferes with normal arterial oxygenation can result in

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dyspnoea. Almost all dyspnoeic animals with pulmonary parenchymal disease will have abnormalities on thoracic auscultation.

Normal lung sounds

Normally thoracic auscultation reveals bronchial and vesicular sounds. Bronchial sounds are tubular sounds similar to those heard over the trachea and are more prominent in the hilar areas. Vesicular sounds are likened to "wind through the trees," are softer, and are heard more peripherally.

Abnormal lung sounds

Abnormal lung sounds are described as crackles or wheezes.

- **Crackles.** Non-musical, discontinuous noises similar to cellophane being crumpled or bubbles popping. Crackles are usually associated with pulmonary parenchymal abnormalities or exudate/oedema within airways.
- **Wheezes.** More musical, continuous high-pitched whistling sounds. Wheezes suggest airway narrowing due to bronchoconstriction.

Pulmonary oedema

When coughing, dyspnoea, and abnormal thoracic respiratory sounds are due to pulmonary oedema, cardiac abnormalities should also be detectable. These may include:

- Alterations in palpable or audible cardiac impulse.
- Reduced pulse amplitude.
- Tachyarrhythmias.
- Murmurs consistent with aortic stenosis or mitral insufficiency or murmurs suggesting left to right shunting.

These manifestations of cardiac dysfunction can be supported by radiographic or echocardiographic evidence for alterations in normal cardiac structures. All primary respiratory problems may produce some degree of pulmonary hypertension, which can result in secondary right cardiomegaly.

Diagnostic procedures

Patients with productive coughing usually require some combination of the following diagnostic procedures for further elucidation of their bronchopulmonary disease:

- Thoracic radiography.
- Bronchial washings.
- Transtracheal washings.
- Transthoracic pulmonary aspirates.
- Heartworm tests: serology.
- Arterial blood gas analysis.
- Open-chest lung biopsy.

Define the lesion

Disorders of the Trachea and Bronchi

As previously mentioned, disorders of the trachea and large bronchi usually cause a chronic non-productive cough. Disease of the smaller bronchi may cause a productive cough, and wheezes and crackles are commonly

auscultated. The most common disease of the trachea and bronchi are:

- Canine infectious tracheobronchitis.
- Collapsing trachea.
- Allergic bronchitis e.g., feline "asthma."
- Parasitic bronchitis (lungworm).
- Chronic bronchitis.

The most frustrating of these diseases to manage is chronic bronchitis in small terrier type dogs. I usually find that a combination of any of the following can be helpful, but often only transiently:

- Corticosteroids.
- Bisolvon.
- Bronchodilation (aminophylline or terbutaline).
- +/-physiotherapy (steam treatment).

Narcotic antitussives e.g. hydrocodone (Hycomine: (0.22 mg/kg s.i.d.— q.i.d. p/o) can be very useful in the management of dogs with tracheal collapse for whom other medications (corticosteroids, bronchodilators) do not give adequate control. See later notes on respiratory drugs for further details.

Pulmonary parenchymal disease

Clinical signs. Pulmonary parenchymal disease is characterised by dyspnoea (either during expiration or throughout the respiratory cycle), abnormal thoracic lung sounds, and productive coughing. Causes of pulmonary parenchymal disease include:

- Inflammation (infection, allergic, immune-mediated).
- Thromboembolism.
- Neoplasia.
- Edema.
- Emphysema.

Inflammatory pulmonary parenchymal disease

Classification. Inflammatory pulmonary parenchymal disease can be classified as infectious or non-infectious (immune-mediated). The cause of the parenchymal inflammation should be established, as therapy for the various immune-mediated inflammatory problems will be contraindicated in those cases with an infectious aetiology. The various causes of infectious pulmonary parenchymal disease include:

- Viral.
- Bacterial.
- Fungal.
- Parasitic.

Non-infectious immune-mediated inflammation may have an allergic aetiology although the underlying cause is often ill defined.

Pulmonary Thromboembolism

What causes thromboemboli to form? Thromboemboli generally form as a result of disease in organs other than the lungs. Circulating emboli such as bacteria, fat, air, parasites, and circulating parts of thrombi from elsewhere in the body can be trapped in the pulmonary vascular system.

Thrombi can develop within vessels as a result of:

- Venous stasis.
- Turbulent blood flow.
- Endothelial damage.
- Systemic hypercoagulability.

Thrombi are usually eliminated soon after formation although this balance may become disturbed in many disease states. The most common conditions associated with thromboembolism include:

- *Dirofilariasis*/angiostrongylosis.
- Hyperlipidaemia.
- Hyperadrenocorticism.
- Hypothyroidism.
- Glomerulopathies.
- Immune-mediated haemolytic anaemia.
- Pancreatitis.
- DIC.

Pathophysiology. The interference in pulmonary blood flow caused by the thromboemboli results in ventilation-perfusion abnormalities producing hypoxaemia and hypo- or hypercapnia, depending on the degree of respiratory drive. Pulmonary hypertension may occur acutely with massive obstruction or reflex vasoconstriction. This occurs more commonly in chronic cases with recurrent disease. Pulmonary infarction is relatively uncommon.

Clinical signs. The sudden onset of hypoxia produces peracute dyspnoea and tachypnoea. Occasionally coughing or abnormal lung sounds are present. In cases with recurrent disease there may be right cardiomegaly or split second heart sounds; evidence for pulmonary hypertension.

Diagnosis. Diagnosis is based on thoracic radiography, angiography and nuclear scintigraphy. In many cases of pulmonary thromboembolism, thoracic radiographs are normal despite severe respiratory signs and blood gas evidence for marked ventilation-perfusion abnormalities. Such inconsistency is highly suspicious for pulmonary vascular disease. Truncated pulmonary arteries occasionally ending in focal areas of interstitial or alveolar radiodensities are rare pathognomonic signs. More frequently definitive diagnosis requires angiographic demonstration of truncation and/or intravascular filling defects.

Pulmonary Oedema

Pulmonary oedema is most likely to be a result of left atrial hypertension brought about by left sided heart disease. Less commonly, pulmonary overperfusion or increased permeability of the pulmonary vasculature may be the underlying mechanism.

Pulmonary Neoplasia

Primary pulmonary tumours, metastatic neoplasia and multicentric neoplasia can all involve pulmonary parenchyma. Although most primary pulmonary tumours are malignant, metastases are not common in the early phases of the disease; consequently, complete surgical removal provides an opportunity for a significant postoperative period of remission.

Clinical signs. Usually, clinical signs are typical of general pulmonary parenchymal disease. They are usually chronic and slowly progressive, although peracute manifestations may occur with complications such as pneumothorax or thromboembolism.

Radiology. Thoracic radiography frequently reveals focal areas of increased radiodensity with obliteration of all underlying structures. Margins are often distinct and cavitation may be present. Metastatic or multicentric disease results in a diffuse interstitial pattern with or without nodular changes.

Diagnosis. A tissue diagnosis may be achieved by bronchial washings or bronchoalveolar lavage although direct tissue biopsy is often required.



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