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DYSPNEA IN THE CAT - AN UPDATE

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Thoracic disease in the cat can present as one of a multitude of disorders. Many of the problems are treatable pending a definitive diagnosis while others are classified as non-treatable. It is important for the practitioner to accurately identify the exact disease process in order to implement what might end up to be life saving treatment. On the other hand, the early recognition of a non-treatable disease in a dyspneic patient can avoid protracted suffering to the cat and excess expense to the client.

Dyspnea and tachypnea are the most characteristic signs of feline pulmonary and pleural diseases. Although coughing is a sign frequently associated with tracheal and bronchial disorders, the clinician should be aware that most feline pulmonary and pleural disorders are not associated with coughing. Because the dyspneic cat is often in critical status, the primary clinical objective is to expediently diagnose the cause and simultaneously provide supportive treatment.

The etiologies of respiratory embarrassment can involve lesions anywhere along the respiratory tract, the pleural space, or the heart. Therefore it behooves the clinician to obtain a complete history and perform a detailed physical examination in order to accurately localize the primary lesion. Emergency situations might initially require an abbreviated history and physical followed by a more detailed study following the patient's stabilization.

The diagnosis of most thoracic diseases in the cat usually requires the use of diagnostic aids. Depending on the problem at hand, such tests might include: hemograms, serum biochemistry determinations, cytology and culture of respiratory secretions, serology, electrocardiography, tissue biopsy, and thoracic radiography. To avoid compounding the stress to the dyspneic cat, certain diagnostic procedures might have to await the clinical response to symptomatic emergency therapy in order to avoid iatrogenic complications.

The criteria for classifying thoracic disease will vary amongst the internist, radiologist and pathologist. Since chest radiography is one of the most informative diagnostic tools, this manuscript will discuss the feline pulmonary and pleural diseases on the basis of radiographic abnormalities. Because of space constraints, only the most common abnormalities will be discussed.

I. ALVEOLAR ABNORMALITIES

Radiographically alveolar signs consist of fluffy, ill-defined, cotton candy type of infiltrates associated with the presence of air bronchograms and/or air alveolargrams. This pattern may be localized or disseminated depending on the etiology and the duration of disease. The most common causes of an alveolar pattern abnormality in the cat include pulmonary edema of cardiogenic origin, non-cardiogenic pulmonary edema associated with electrical shock and toxic irritants, pneumonia (bacterial, hypersensitivity, mycotic, protozoan), and pulmonary hemorrhage (coagulopathies, trauma), and atelectasis. These disorders are outlined in Table 1.

II. INTERSTITIAL PULMONARY DISEASES

Interstitial diseases primarily involve the supportive tissues of the lung leaving the air spaces grossly uninvolved. Sometimes the underlying diseases allow the accumulation of fluid and/or cells to eventually reduce the air content of the lung tissue by reducing the size of the alveoli or by compressing the air spaces. Interstitial patterns are characterized as increases in pulmonary background density associated with changes in the interstitial structures which cannot be individually recognized; or they can appear as more distinct nodular, linear, or reticular type patterns. Air bronchograms are not associated with interstitial diseases except when certain disorders extend beyond the interstitium to also involve the alveoli. Examples and descriptions of feline interstitial diseases are provided in Table 2.

III. BRONCHIAL DISEASE

In the cat, bronchial disease is well typified in the "feline bronchial asthma syndrome." Thoracic radiography reveals characteristic accentuation of the bronchovascular markings. The bronchial wall thickening is caused by bronchial mucosal cell hyperplasia, thickening of the smooth muscular layer, and peribronchial cellular infiltrates consisting of eosinophils and mononuclear cells. On the radiograph, the thickened bronchi appear as "doughnuts."

The exact cause of feline bronchial asthma is unknown, although a hypersensitivity is suspected due to the histopathologic changes and the good response to glucocorticoid drugs. The history denotes paroxysms of a dry hacking cough alternating with periods of normalcy. Usually there is no traceable allergen in the history. With time the cough worsens and exercise intolerance occurs. The cat then presents in acute respiratory distress.

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The pertinent physical examination findings vary with the stage of disease. The respiratory pattern ranges from normal to overt dyspnea. Lung sounds are normal or harsh. Sometimes moist crackles can be auscultated. A cough may or may not be present at the time of examination.

Characteristic diagnostic findings include radiographically thickened bronchi and occasionally eosinophilia on the hemogram. Transtracheal wash cytology reveals many eosinophils without signs of infection.

Treatment consists of intravenous glucocorticoids and intramuscular aminophylline during times of crises. In extreme states 1/2-3/4 cc of epinephrine (diluted to 1:10,000) can be given IM. In less urgent circumstances, oral prednisolone can be given for a 1-2 week period. Where oral prednisolone cannot be given, the author has found success with the use of Depo-Medrol (UpJohn Company, Kalamazoo, MI) at a dose of 10-20 mg given IM. Repeated treatment depends on the frequency of relapse.

The prognosis is usually excellent, but the owner should be warned of future relapses. Chronic recurring disease will predispose to chronic bronchitis or fibrosis and require the long-term use of bronchodilating drugs.

IV. PLEURAL EFFUSIONS

Pleural effusion denotes a collection of fluid in the pleural space. Grossly the liquid is characterized as blood, chyle, pus or when nondistinctive, as plain effusions. It might be broadly classified as a transudate or an exudate; the former having a lower specific gravity and protein content than the latter.

Pleural effusion is formed under the following general circumstances: (1) an imbalance of the transpleural hydrostatic pressure (congestive heart failure) or protein osmotic forces (hypoalbuminemia), (2) a change in the permeability of the membrane (pleuritis), (3) a decrease in the rate of reabsorption (pleuritis and lymphatic obstruction), or combinations of these mechanisms. The consequences to the patient by the mere presence of the fluid include decreases in lung vital capacity and total lung capacity.

The clinical signs of pleural effusion depend on the underlying etiology. It is important to consider the effusion only as "the tip of the iceberg". It behooves the clinician to determine the underlying cause in order to establish an accurate prognosis and formulate a specific treatment plan. The basic sign in all cats with moderate to large amounts of pleural effusion is dyspnea. Cough is seldom present unless the underlying cause results in bronchial or tracheal compression or irritation.

The classic radiographic features of pleural effusion include: loss of detail of the cardiac outline, incomplete expansion of the lungs, fissure lines, blunting of the caudal lung lobe angles, scalloped lung lobe borders, and sometimes pleural thickening. Other thoracic radiographic abnormalities will depend on the specific cause. When thoracic detail is obscured, it is important to repeat the radiographs following chest drainage to help identify any underlying cause.

There are several etiologies of pleural effusion in the cat. Table 3 provides a clinical description of the more common types.
<table>
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<tr>
<th>Disease</th>
<th>Predisposing or Direct Cause</th>
<th>Other Diagnostic Findings</th>
<th>Treatment Principles</th>
<th>Prognosis</th>
</tr>
</thead>
</table>
| Bacterial pneumonia     | 1. Viral respiratory infection  
2. Aspiration  
3. Primary/idiopathic | - Fever  
- Leukocytosis  
- Radiographic lobar involvement; ventral common  
- Tracheal wash cytology: WBC’s, bacteria | 1. Maintain hydration with parenteral fluids  
2. Provide O₂  
3. Antibiotics  
4. Bronchodilating drugs | Fair to guarded |
| Chemical pneumonitis    | 1. Smoke inhalation  
2. Aspiration of oral or gastric secretions | - History & physical findings obvious with smoke inhalation  
- Aspiration commonly occurs with altered consciousness or iatrogenic  
- Bacterial pneumonia commonly complicates | 1. Assure patent upper airway  
2. Broad spectrum antibiotics  
3. Bronchodilating drugs | Fair to guarded |
| Cardiogenic pulmonary edema | 1. Cardiomyopathy  
2. Hyperthyroid-induced myocardial hypertrophy  
3. Congenital  
4. Acquired valvular disorders | - Characteristic auscultable findings: murmurs, gallop rhythm, arrhythmias  
- Radiographic cardiomegaly with pleural effusion or alveolar infiltrate  
- EKG & echocardiographic changes | 1. Provide O₂  
2. Furosemide  
3. Specific cardiac drugs depending on exact pathology | Guarded to grave |
| Noncardiogenic (neurogenic) pulmonary edema | 1. Electrocution  
2. Post seizure | - Electrocution: acute onset, oral burn, dorsocaudal radiographic pulmonary alveolar infiltrate  
- Post seizure | 1. Furosemide  
2. Provide O₂ cage  
3. Avoid dehydration | Guarded to good |
<table>
<thead>
<tr>
<th>Disease</th>
<th>Cause</th>
<th>Helpful Ancillary Clinical Findings</th>
<th>Treatment</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstitial edema</td>
<td>(1) Cardiomyopathy &amp; other causes of congestive heart failure</td>
<td>Gallop rhythm, echo- &amp; electrocardiographic abnormalities, cardiomegaly</td>
<td>(1) Diuretics, O₂, specific cardiac drugs such as digoxin or propranolol depending on type of cardiac pathology</td>
<td>(1) Guarded to grave</td>
</tr>
<tr>
<td></td>
<td>(2) Noncardiogenic hypoalbuminemia</td>
<td>History of exposure to toxic inhalants, viral infections, iatrogenic fluid overload, electric cords</td>
<td>(2) Diuretics, O₂, removal of insulting agent, theophylline</td>
<td>(2) Good to poor depending on associated cause</td>
</tr>
<tr>
<td>Interstitial pneumonia</td>
<td>Viral respiratory disease</td>
<td>Fever, nasal discharge, sneezing, conjunctivitis, oral ulcerations, history of exposure to infected cats, viral isolation</td>
<td>Supportive: maintain hydration &amp; nutrition, antibiotics for 2E bacterial complications</td>
<td>Good to fair</td>
</tr>
<tr>
<td>Granulomatous disease</td>
<td>Systemic mycoses, toxoplasmosis, irritating inhalants, immune-mediated disease</td>
<td>Knowledge of geographic origin where mycotic disease prevails; dietary &amp; environmental history; presence of other coexisting organ abnormalities; serology; tissue biopsy</td>
<td>Toxoplasmosis-pyrimethamine &amp; sulfadiazine; clindamycin Histoplasmosis &amp; blastomycosis - Amphotericin B Immune mediated disease - immunosuppressants</td>
<td>Fair to grave</td>
</tr>
<tr>
<td>Pulmonary fibrosis</td>
<td>Healing phase of several disease processes; sometimes idiopathic; old age change</td>
<td>History of prior pulmonary inflammatory disease; normal hematologic &amp; cytologic test results; sometimes history reveals chronic coughing; absence of other physical abnormalities</td>
<td>Bronchodilating drugs such as theophylline or aminophylline; occasional short-term use of glucocorticoids</td>
<td>Fair to poor</td>
</tr>
<tr>
<td>Metastatic lung neoplasia</td>
<td>Extrapulmonary source of malignant neoplasia, ie. mammary adenocarcinoma</td>
<td>Coughing is rare; location of primary source of neoplasia via physical exam, radiography, or surgery; tissue biopsy with histopathologic confirmation; needle aspiration cytology</td>
<td>Chemotherapy; surgical removal of primary tumor if indicated</td>
<td>Usually grave</td>
</tr>
</tbody>
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<table>
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<tr>
<th>Primary lung neoplasia</th>
<th>Example: bronchogenic carcinoma</th>
<th>Physical exam might reveal muffled chest sounds on the involved side; radiography strongly suspicious; neoplastic cells on needle aspirate or surgical biopsy specimens; cough is rare unless there is bronchial impingement</th>
<th>Chemotherapy, surgical removal</th>
<th>Usually grave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung worms Aleurostrongylosis</td>
<td>Mixed pattern on radiographs; findings of larval forms on fresh fecal smears &amp; Behrman technique; coughing a common associated finding; eosinophilia on hemogram</td>
<td>(a) Levamizole - 20 to 30 mg/kg once every other day for five treatments (b) Fenbendazole 50 mg/kg/day x 3 d</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Lung fluke Paragonimus kellicotti</td>
<td>Radiographs: solid or cavitated, circumscribed densities usually in caudal lobes; coughing common, fluke eggs on fecal, eosinophilia</td>
<td>(a) Albendazole - 50 mg/kg/day minimum of 14 days (b) Fenbendazole 50 mg/kg/day x 10 d (c) Praziquantel 25 mg/kg Q 8 h x 2 d</td>
<td>Good to fair</td>
<td></td>
</tr>
<tr>
<td>Heartworms Dirofilaria immitis</td>
<td>Diffuse interstitial infiltrate; pulmonary artery enlargement; ** right heart enlargement; eosinophilia</td>
<td>Author does not recommend thiacetarsamide treatment; treat symptomatically with glucocorticoids &amp; for heart failure (if present)</td>
<td>Guarded</td>
<td></td>
</tr>
<tr>
<td>Cause</td>
<td>Associated Physical Findings</td>
<td>Associated Clinical Findings</td>
<td>Fluid Type and Characteristics</td>
<td>Treatment</td>
</tr>
<tr>
<td>-------------------------------</td>
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<tr>
<td>Congestive cardiomyopathy</td>
<td>- Dyspnea</td>
<td>- Muffled chest sounds</td>
<td>(1) Obstructive effusion</td>
<td>(1) Removal of fluid by thoracentesis</td>
</tr>
<tr>
<td></td>
<td>- Sometimes heart murmurs</td>
<td>- Cardiac gallop rhythm</td>
<td>(2) Serous, pseudochyloous, or serosanguineous</td>
<td>(2) O2, (3) Diuretics, (4) Digoxin</td>
</tr>
<tr>
<td></td>
<td>- Rarely ascites</td>
<td>- Occasionally aortic</td>
<td>(3) Modified transudate</td>
<td>(5) Taurine 500 mg bid</td>
</tr>
<tr>
<td></td>
<td>- Occasionally aortic</td>
<td>- Thromboembolism</td>
<td>(4) Cytology: initially mainly RBC’s &amp; lymphocytes with smaller numbers of neutro-phil, macrophages, &amp; mesothelial cells</td>
<td></td>
</tr>
<tr>
<td>Lymphosarcoma</td>
<td>- Dyspnea</td>
<td>- Muffled chest sounds</td>
<td>(1) Obstructive effusion</td>
<td>(1) Thoracocentesis</td>
</tr>
<tr>
<td></td>
<td>(sometimes mainly anteriorly)</td>
<td>- Noncompressible anterior</td>
<td>(2) Serous or serosanguineous</td>
<td>(2) Chemotherapy</td>
</tr>
<tr>
<td></td>
<td>- Noncompressible anterior</td>
<td>- Mediastinal mass causing</td>
<td>(3) Modified transudate or exudate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mediastinal mass causing</td>
<td>- Mediastinal mass causing</td>
<td>(4) Cytology: anaplastic lymphocytes with mixture of RBC, mesothelial cells, macrophages &amp; neutrophils</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mediastinal mass causing</td>
<td>- Mediastinal mass causing</td>
<td>(5) Ocular fundoscopic changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mediastinal mass causing</td>
<td>- Mediastinal mass causing</td>
<td>occasionally</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mediastinal mass causing</td>
<td>- Mediastinal mass causing</td>
<td>(6) Neoplastic lymphocytes on aspirate cytology of the mass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mediastinal mass causing</td>
<td>- Mediastinal mass causing</td>
<td>(7) Rarely hypercalcemia</td>
<td></td>
</tr>
<tr>
<td>Pyothorax</td>
<td>- Dyspnea</td>
<td>- Fever</td>
<td>(1) Septic inflammatory</td>
<td>(1) Thoracocentesis</td>
</tr>
<tr>
<td></td>
<td>- Fever</td>
<td>- Sometimes dehydration</td>
<td>(2) Purulent or sanguinopurulent lavage</td>
<td>(2) Thoracic lavage</td>
</tr>
<tr>
<td></td>
<td>- Fever</td>
<td>- Sometimes dehydration</td>
<td>(3) Pure exudate</td>
<td>(3) Antibiotics</td>
</tr>
</tbody>
</table>

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| Infectious feline peritonitis – "wet-form" | - Dyspnea  
- Fever  
- Muffled chest sounds  
- Occasionally corneal precipitates or fibrinous uveitis  
- Occasionally bilateral "lumpy" renomegaly | (1) Mature neutrophilia  
(2) Hyperglobulinemia with polyclonal gammopathy  
(3) IFP titer undependable & nonspecific | (1) Pyogranulomatous  
(2) Straw-colored, viscous, rarely chylous  
(3) Cytology: moderate numbers of neutrophils, RBC, plasma cells, macrophages, lymphocytes, granular background | (1) Thoracocentesis  
(2) Supportive  
(3) Bacterial growth on culture  
(4) Cytology: many neutrophils containing bacteria, free bacteria, toxic neutrophils, mononuclear cells | Grave  

| Intravenous fluid overload | Sudden onset of dyspnea in cats being Rx with IV fluids; muffled chest sounds; occasionally edema | (1) Possible occult cardiomyopathy made apparent with fluid overload  
(2) Possible coexisting anemia or hypoalbuminemia predisposing to fluid overload  
(3) Sometimes purely iatrogenic from overzealous treatment | (1) Pure transudate  
(2) Clear  
(3) Almost acellular on cytology | (1) Thoracocentesis  
(2) Supportive  
(3) Judicious use of diuretics  
(4) Give plasma or whole blood transfusion for hypoalbuminemia & anemia respectively | Good if no serious underlying cause is present  

| Acute trauma or bleeding disorders | - Dyspnea  
- Variable muffled chest sounds  
- Other signs of trauma or sites or hemorrhage | (1) Trauma-variable  
(2) Coagulopathy - abnormal bleeding parameters; ie, prolonged PT, PTT, low platelet count  
(2) Radiographs in trauma often denote fractured ribs | (1) Blood red; defibrinated  
(2) RBC & WBC proportions similar to blood | Trauma-depending on injury; usually conservative rest in the absence of other serious problems. Coagulopathy - (a) whole blood | Usually good  


<table>
<thead>
<tr>
<th>True chylothorax</th>
<th>Dyspnea</th>
<th>Muffled chest sounds</th>
<th>Possible history of prior chest trauma</th>
<th>Possible causes include heart failure, heartworms, neoplasia</th>
<th>Milky white</th>
<th>Cytophysical normal lymphocytes, small # of RBC, smudge cells</th>
<th>Orange staining chylomicrons with Sudan III</th>
<th>Elevated triglycerides</th>
<th>Surgical ligation of thoracic duct &amp; anomalous lymphatics</th>
<th>Fair to guarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic carcinomas or sarcomas</td>
<td>Dyspnea</td>
<td>Muffled chest sounds</td>
<td>Possible location of extrathoracic source of neoplasia</td>
<td>Radiographs: demonstration of neoplasm</td>
<td>Usual serosanguineous</td>
<td>Obstructive or inflammatory</td>
<td>Cytology: RBC, mononuclear cells, mesothelial cells, anaplastic cells (variable presence)</td>
<td>Thoracocentesis</td>
<td>Surgical removal if there is solitary mass</td>
<td>Guarded to grave</td>
</tr>
</tbody>
</table>