

## RESPIRATORY DISTRESS

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Successful management of the animal in respiratory distress depends on accurate anatomic localization of disease and efficient diagnostic planning. Assessment of the pattern of breathing, careful examination and auscultation of the respiratory tract, and swift determination of the history of the complaint will assist in determining the site responsible for generation of respiratory distress.

**Upper Airway Disorders:** Respiratory difficulty associated with upper airway obstruction may result from disease in the nasal cavity, nasopharynx, and larynx. In general, respiratory difficulty is noted on inspiration in affected dogs or cats. Associated signs include sneezing and nasal discharge in the case of nasal diseases, and voice change, decreased vocalization, or dysphagia with laryngeal diseases.

Cats with chronic rhinitis may have a long-term history of stertorous breathing and sneezing that can ultimately lead to open mouth breathing and respiratory distress if total obstruction of the nasal cavity occurs. Usually localizing nasal signs are readily apparent and nasal obstruction leading to distress is slow to develop, however cats can be adept at hiding the progression of signs. Bilateral occlusion of the nares or complete obstruction of the nasopharynx generally leads to open mouth breathing. Nasopharyngeal obstruction in dogs or cats can result from mass lesions associated with polyps, neoplasia, or fungal infection or with formation of a stenotic scar across the nasopharynx.

Animals with nasal disease causing obstruction generally have decreased nasal airflow on physical examination. Generally, dogs or cats with nasopharyngeal disease can breathe well through the mouth but exhibit distress when one nostril is occluded or when the mouth is held closed. Animals with nasopharyngeal obstruction require oral breathing and sense asphyxiation when the mouth is held closed. Whenever possible, the caudal aspect of the soft palate should be palpated for abnormalities. Generally, the soft palate is easily depressed into the roof of the nasopharynx with digital palpation. A nasopharyngeal mass can be felt as a space-occupying lesion dorsal to the soft palate.

Full evaluation of the patient with nasal obstruction starts with imaging of the region under anesthesia with skull radiographs or computed tomography. Visual inspection of the region via caudal and rostral rhinoscopy is then performed. Caudal rhinoscopy is most easily achieved with a flexible endoscope, however in some animals, rostral retraction of the soft palate and illumination of a dental mirror behind the soft palate allows adequate examination.

Animals with laryngeal disease present with variable degrees of respiratory distress, exercise intolerance, tachypnea, and cough. Careful questioning of the owner may reveal a voice change or a reduction in vocalization. The etiology may be laryngeal paralysis or a mass lesion in the larynx. Laryngeal paralysis (unilateral or bilateral) is relatively common in older, large breed dogs. Bilateral laryngeal paralysis appears to be more common than unilateral in cats. Diagnosis is based on visualization of decreased or absent laryngeal abduction on inspiration. Visualization of the larynx will also identify mass lesions (inflammatory or neoplastic) on laryngeal cartilages, and biopsies should be obtained in all cases. Granulomatous, lymphocytic inflammation of the larynx has been reported in cats and requires intensive medical and/or surgical therapy.

**Airway Disorders:** Airway diseases resulting in respiratory distress include bronchial disease in the cat, tracheal injury, mass lesions, and tracheobronchial foreign bodies. Traumatic injuries to the neck from a dog fight or automobile accident can lead to an acute disruption of the trachea with a rapid onset of respiratory distress. Subcutaneous emphysema is often present. A crushing injury to the neck region can lead to late onset of tracheal disease due to delayed necrosis of the tracheal rings and soft tissues. Late onset injuries may be more difficult to diagnose as external signs of injury are often lacking. A careful history and gentle palpation of the neck region will assist in the diagnosis. Iatrogenic tracheal rupture associated with endotracheal intubation can occur within hours after the insult or may be delayed

for several weeks. This condition is seen more often after dental procedures in the cat and usually responds to conservative management, with emphysema resolving within 1 to 6 weeks. When surgery is required to alleviate clinical signs, the tracheal lesion has been found most often within the thoracic inlet or thoracic trachea. It is important to realize that a small volume of air is required to inflate the cuff of an endotracheal tube. Generally 1-3 mls of air is sufficient.

Cough is a common complaint in animals with foreign bodies or mass lesions in the large, conducting airways, and animals will often show an obstructive breathing pattern characterized by long, inspiration with increased effort. An intraluminal mass can be seen disrupting the column of air within the trachea on radiographs, however a mass lesion in smaller regions can be difficult to discern. Bronchoscopy may allow removal of a foreign body, and biopsy or debulking of a mass lesion in the airways, however some cases require resection and anastomosis for definitive resolution of disease. Tracheotomy may be required in animals with high cervical lesions.

Cats with airway obstruction due to feline bronchial disease may also have a history of cough, however many cats present with acute bronchoconstriction as a complaint. These cats typically have increased adventitious lung sounds and wheezes can be apparent on expiration.

**Parenchymal Diseases:** Disorders of the pulmonary parenchyma associated with respiratory difficulty include pneumonia, pulmonary edema, and interstitial diseases. Pulmonary edema is often associated with an acute onset of clinical signs and may follow a history of lethargy and exercise intolerance. Dogs or cats with pulmonary fibrosis typically display exercise intolerance, and tachypnea or difficulty breathing can be noted later during the course of disease. Animals with pneumonia often have a vague history of illness characterized by anorexia, malaise, and weight loss.

It can be difficult to distinguish animals with heart failure from those with respiratory disease. Cats with bronchial disease typically have a history of cough, while cough is generally absent in feline heart disease. Dogs with chronic bronchitis have a harsh, paroxysmal cough while a soft cough is more typical in dogs with heart failure.

On presentation, tachypnea and/or hyperpnea are often evident on physical examination. Crackles on inspiration are typically ausculted over the entire thorax in animals with pulmonary fibrosis and vary in severity from mild to severe. Crackles detected in animals with pneumonia or pulmonary edema are often softer and may be localized to certain lung regions. Abnormal lung sounds in the animal with aspiration pneumonia may be detected in the cranioventral lung regions or the middle lung lobes. The presence of a gallop rhythm or arrhythmia places the diagnosis of cardiac disease higher on the differential list, however, up to 30% of cats with hypertrophic cardiomyopathy lack a cardiac murmur and mitral murmurs can be found in normal cats and dogs. Heart rate is not as helpful in differentiating cardiac from respiratory disease in the cat as it is in the dog, since cats do not commonly develop a respiratory arrhythmia in association with lung disease.

In the animal with severe respiratory difficulty, care should be taken to reduce stress and to do no harm. Placing the pet in a quiet, oxygen-enriched environment stabilizes its condition to allow some diagnostic tests to be performed. Radiographs are performed when the animal's breathing has improved, and oxygen should be supplied to these animals during the procedure. Radiographic patterns are critical in constructing a list of differential diagnoses for the animal's problem related to various parenchymal conditions. In the dog, pulmonary edema is characterized by perihilar alveolar infiltrates while in the cat, a more diffuse pattern is typically noted. Left-sided cardiomegaly is typically seen in association with pulmonary edema. Interstitial fibrosis is typically identified as a generalized increase in interstitial densities that may be mild.

Further diagnostics are performed depending on the most likely disease present. Cardiac disease is supported by performing an electrocardiogram and echocardiography. Evidence of chamber enlargement on an electrocardiogram (R-wave amplitude > 0.9 mV in lead II in a cat or > 2.5 mV in a dog) might be considered suspicious of cardiac disease. In the cat, echocardiography is often required to provide a definitive diagnosis of cardiomyopathy and to provide optimal therapy. When pneumonia is most likely, airway samples should be collected for aerobic and anaerobic bacterial culture and for cytologic

examination. Interstitial lung diseases remain the most difficult to diagnose since lung biopsy is required for characterization.

**Pleural Abnormalities:** Dogs and cats with pleural disease often present with acute signs of respiratory distress despite long-standing disease. The primary clinical sign associated with pleural disease is shortness of breath, with a rapid, shallow breathing pattern. Elbows are abducted and the neck is extended in order to improve the movement of air into the alveoli. Usually, the degree of respiratory distress is associated with the rapidity of fluid or air accumulation rather than with the specific volume present. Cats seem to be particularly sensitive to addition of a final, critical volume of fluid that overcomes their ability to compensate for filling of the pleural space.

Auscultation and percussion of the chest wall aids in the diagnosis of a pleural disorder, although percussion in a cat or small dog is limited because of the small size of the thoracic cavity. With pleural effusion, lung sounds are ausculted in the dorsal fields only and muffled sounds are heard ventrally. Heart sounds are also muffled. Percussion of a chest cavity filled with fluid reveals dull sounds in affected areas. Pneumothorax leads to an absence of lung sounds dorsally due to compression by air. Lung sounds are present in the ventral fields only. In an animal with pneumothorax or air trapping, sounds have increased resonance.

Animals with a pleural disorder often present with acute respiratory embarrassment. An immediate decision must be made whether to proceed with diagnostic radiographs or to perform thoracocentesis, and this decision is usually based on physical exam findings. When taking radiographs, it is important to place the animal in sternal recumbency rather than performing a ventrodorsal view. Positioning for the VD view places excessive stress on the respiratory system and increases the likelihood of decompensation. Both left and right lateral views are beneficial, especially when unilateral effusion is present.

Thoracocentesis is performed as a diagnostic and therapeutic technique, before or after radiographic confirmation of a pleural disorder. The region of the 7<sup>th</sup> – 9<sup>th</sup> intercostal space is clipped and scrubbed in an area below the costochondral junction for fluid, or in the dorsal 1/3 of the chest for air. I prefer to use a 19-21 gauge butterfly needle on extension tubing to perform thoracocentesis in cats and small dogs. Alternately, a fenestrated 16-20 gauge catheter with extension set can be used when a large pleural effusion is present. A 3-way stopcock and syringe should be immediately accessible for attachment to the extension set after the pleural space is entered. Specimen collection should be anticipated: EDTA and clot tubes and a culturette swab should be available, along with a bowl to collect large volumes of fluid. In-house pleural fluid analysis should always include a PCV, cell count, protein or specific gravity, and cytology. Smears can also be prepared for Gram staining.