

consultant on call



Acute Breathing Difficulty in the Dog & Cat: What's the Cause?

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DEFINITION

ABD is sudden onset of labored and/or rapid respiration.

SYSTEMS

ABD can be caused by pathologic conditions or obstruction associated with the nasal passages, oral cavity, pharynx, larynx, trachea, bronchial tree, alveoli, pulmonary vasculature or lymphatics, pulmonary innervation, thoracic wall, diaphragm, or pleural space.

GENETIC IMPLICATIONS

Respiratory distress can occur in any breed.

INCIDENCE/PREVALENCE

Unknown

GEOGRAPHIC DISTRIBUTION

Worldwide

SIGNALMENT

Species. Any

Breed predilection. Any

Age and range. Any

Gender. Any

CAUSES

Extrathoracic or intrathoracic upper airway obstruction, lower airway disease, pulmonary parenchymal disease, pleural disease, neuromuscular disease



A cat diagnosed with bronchial hypersensitivity. The patient is agitated and unwilling to be restrained, is exhibiting extended expiratory effort, and with a stethoscope can be heard wheezing.

RISK FACTORS

Brachycephalic conformation, heart disease, head/cervical/thoracic trauma, coagulopathy, systemic disease

PATHOPHYSIOLOGY

Progression of clinical signs associated with ABD occurs in the following order, from least to most severe: increased respiratory rate, change in breathing pattern with increased work of breathing, change in posture, open-mouth breathing, cyanosis (3-5 g/dl deoxygenated hemoglobin), death. Cyanosis, severe work of breathing (active intercostal muscle contraction for movement of the rib cage, head and neck extension, open-mouth breathing with lips retracted at the commissures), barrel-chested appearance of the rib cage, and/or blood or foam coming from the airway are signs of

catastrophic acute breathing difficulty.

These animals are moribund. Severe work of breathing is manifested by using the abdominal muscles and diaphragm for chest movement. The amount of work required depends on the extent to which the lung or thorax is involved and whether the problem is acute (more work required) or chronic.

PAIN / ANXIETY INDEX

Anxiety and severity of pain vary, depending on the underlying cause. A high degree of anxiety is expected with any cause of breathing difficulty, and treatment with anxiolytics (e.g., diazepam 0.2 mg/kg IV/IM) or sedatives that do not impair respiration (e.g., butorphanol 0.4 mg/kg IV/IM) are indicated.

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ABD = acute breathing difficulty



Diagnosis

HISTORY

The presence of exercise intolerance or a soft cough **in the presence of a heart murmur or arrhythmia** can suggest a cardiac cause. Harsh coughing, sneezing, or nasal discharge can suggest an infectious cause; the history of vaccination and heartworm prevention helps determine whether an infectious cause is likely. Exposure to stray or unfamiliar animals may direct diagnostics toward pneumonia or nasal discharge/airway secretions resulting from a contagious infectious disease, such as distemper, *Bordetella*, or feline viral upper respiratory infections.

PHYSICAL EXAMINATION

Careful auscultation of the heart may reveal murmurs, gallop, or other arrhythmias. Perfusion status (evaluated by examining heart rate, capillary refill time, pulse quality, mucous membrane color) reflects the effects of respiratory pathology on the body. Careful thoracic auscultation should be done to evaluate for subtle postresuscitation changes, muffled heart or lung sounds (suggestive of pleural space disease), louder-than-normal lung sounds, crackles or rales (suggestive of parenchymal disease), high pitches or wheezes (suggestive of small airway disease), or areas of dull lung sounds (suggesting a space-occupying mass or collapse or consolidation of lung in the area of dullness).

Palpation of the trachea may reveal irregularities and may stimulate coughing, suggesting tracheal irritation: When a patient has a tracheal collapse that intermittently results in a respiratory attack, palpation may uncover the problem. Some pet owners may not describe a cough when they present their animal for breathing problems. We have also seen intermittent breathing diffi-



Puppy showing extension of head and neck as well as rapid and labored smooth breathing indicative of parenchymal disease. The diagnosis was noncardiogenic pulmonary edema due to choking.

culty with bronchial foreign bodies which may cause tracheal irritation.

Palpation of the skin for any evidence of subcutaneous emphysema may be suggestive of chest wall, thoracic inlet, or airway rupture. Palpation of the chest wall may reveal deviations, wounds, or painful regions suggestive of rib fracture or respiratory pathology. If palpation of the abdomen suggests reduced abdominal contents, a diaphragmatic hernia may be present. Evidence of any masses or organ abnormalities might contribute to the respiratory pathology (e.g., tumor metastasis, causes of vomiting and aspiration).

Rectal temperature may be increased with inflammation or infection, and low with poor perfusion.

DEFINITIVE DIAGNOSIS

See **Management Tree**, pages 8-9, for localization of lesion and immediate therapy for the patient with signs of ABD. It is important to determine the location of the pathology (large airway, pleural space disease, parenchymal disease, small airway) by observing the pattern of breathing and careful auscultation. Observation of the

juncture between the rib cage and abdomen can help determine whether the chest and abdomen are moving together in the same direction or in opposition. It is also important to note the time of inspiration to expiration ratio (normally 1:2).

■ If breathing is loud (i.e., can be heard without the aid of a stethoscope), **large airway obstruction** is the likely cause.

- Catastrophic large airway obstruction presents with severe cyanosis and cardiovascular compromise. Breathing sounds may not be heard if the obstruction is almost complete, if the animal is losing consciousness, or if the animal is exhausted from trying to breathe against an obstruction.

- Inspiratory stridor suggests **extrathoracic large airway pathology** and expiratory stridor suggests **intrathoracic large airway pathology**. Stridor on both inspiration and expiration suggests either involvement of the entire trachea, such as tracheal collapse, or a fixed airway obstruction, such as a mass.

■ Rapid, shallow breathing with the chest and abdomen moving together in the same direction at the same time is most compatible with lung **parenchymal disease**. Auscultation will reveal louder-



A cat with opposite chest and abdominal wall movement, signifying pleural disease. A posture that keeps the chest off the floor is assumed so that inhalation is not restricted. The diagnosis was mediastinal mass and pleural effusion.

than-normal lung sounds with early disease and crackles and rales in the area of involvement with severe disease. Cats with parenchymal disease have louder-than-normal lung sounds as the primary finding on auscultation.

- An irregular breathing pattern, with the chest and abdomen moving in opposition to each other is most compatible with **pleural space disease**. Auscultation may find dull or muffled lung sounds in the location of the pathology. Percussion in large-breed dogs can reveal an area of dullness at the site of the pleural space pathology. Lung sounds can be normal in a cat with pleural space disease, although in pneumothorax, hyperresonant percussive sounds are present.

- Animals with catastrophic tension pneumothorax present with a barrel-chested appearance and severe cardiovascular compromise. Chest wall movement is minimal.

- Diagnostic thoracocentesis is performed in animals suspected to have pleural space disease. The amount of air or fluid removed should be recorded and the sample saved for analysis. Repeated centesis will indicate recurrence rates and suggest need for a chest tube. Ultrasonography may aid in recovery of loculated pleural fluid.

- In cats, a noncompressible anterior mediastinum suggests an anterior mediastinal mass.
- Short inspiration and prolonged expiration, with an expiratory push of the diaphragm, is compatible with **small airway disease**. Auscultation may find high-pitched wheezes.
- Rapid breathing with normal-to-decreased effort can also be caused by pain, CNS disease, peripheral nerve pathology, neuromuscular disease, and muscle pathology.
- Assessing arterial PaO_2 or PaCO_2 is an important contribution to evaluation of these cases.



Additional Testing

- **Pleural fluid** should be submitted for fluid analysis, cytologic examination, culture and sensitivity, and FIP polymerase chain reaction (in cats).
- An **oropharyngeal examination** is indicated with upper airway inspiratory stridor, titrating an injectable anesthetic to evaluate the soft palate, laryngeal function, and other oropharyngeal structures.
- **Radiographs** of chest and other affected body regions are evaluated for pleural air or fluid, pleural fissure lines, masses, pulmonary infiltrates, alveolar lung pattern, bronchiolar markings, rib structure, diaphragm structure, airway structure, mediastinal structures, diameter of the vena cava, heart size and shape, and evidence of heartworm pathology. *Do not radiograph an unstable animal in catastrophic or severe distress prior to stabilization, including administration of anxiolytics and analgesics and suction of the oropharynx.*
- Allow the animal to assume the position that causes the least amount of distress (a dorsoventral view of the chest might be all that is possible). Nasal films taken under general anesthesia are necessary when a nasal obstruction is suspected. Cervical films may be indicated if there is upper airway pathology. Abdominal films are indicated in suspected cases of diaphragmatic hernia, neoplasia, granulomatous lung disease, acute respiratory distress syndrome, or systemic disease.
- **Fluoroscopy** can aid with lung aspirates or detecting dynamic tracheal collapse.
- **Ultrasonography** can be done for pleural fluid, pericardial fluid, heart disease, mass lesions, and to assist with fluid centesis.

ABD = acute breathing difficulty; FIP = feline infectious peritonitis

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- **Transtracheal wash** is indicated once the animal is stable to assess the cells and organisms in the large and small airways when there is lung or airway disease that produces fluid or exudates.
- **Bronchoscopy** and bronchoalveolar lavage is indicated if transtracheal wash has been unproductive, if the lung disease is not producing fluid or exudate, or if the

pathology seems to involve only focal lung lobes or airways.

- Measurement of pulse oximetry by rectal probe in the awake animal is helpful in determining oxyhemoglobin saturation.
- Immediate venous blood gas, electrolytes, glucose, packed cell volume, total protein, and activated clotting time should be measured and platelets estimated.

Complete blood count, serum biochemical profile, urinalysis, and coagulation profile may also be done. ■

See Aids & Resources, back page, for references, contacts, and appendices.

Causes of Acute Breathing Difficulty

Disorder	Cause	Disorder	Cause
LARGE AIRWAY DISEASE	Foreign body obstruction Mass or anatomical defect Airway rupture Collapsing trachea Laryngeal paralysis, collapse Smoke inhalation Pneumonia or nasal/airway congestion from infectious diseases Elongated soft palate	PLEURAL SPACE DISEASE	Pneumothorax Hemothorax Pyothorax Chylothorax Pleural space or mediastinal masses Pneumomediastinum Diaphragmatic hernia Right heart failure Obstruction of vena cava Neoplasia Heartworm disease Low plasma osmotic pressure (hypoalbuminemia)
SMALL AIRWAY DISEASE	Feline asthma Bronchial inflammatory disease, bronchiectasis Chronic obstructive lung disease Bronchogenic pneumonia Inhaled foreign body	NEUROMUSCULAR DISEASE	Chest wall or muscle trauma Rib fractures Diaphragmatic hernia Electrolyte imbalances (hypokalemia, hyperkalemia, hypocalcemia, hypomagnesemia) Pathology of phrenic nerve Brain stem, cervical, or thoracic spinal cord disease Peripheral neuropathy Neuromuscular disease Muscle disease
PARENCHYMAL DISEASE	Cardiogenic pulmonary edema Noncardiogenic pulmonary edema (intravascular volume overload, asphyxiation, head injury, electrocution) Smoke inhalation Pneumonia Pulmonary thromboembolism Acute respiratory distress syndrome Pulmonary contusions or hemorrhage Lung atelectasis Pulmonary neoplasia Pulmonary granulomatous disease Pulmonary parasitism Pulmonary infiltrates with eosinophils Interstitial parenchymal disease, such as fibrosis (it causes increased rate and effort to breathe due to hypoxemia) Emphysema	NONRESPIRATORY CAUSES	Systemic disease Pain Metabolic acidosis