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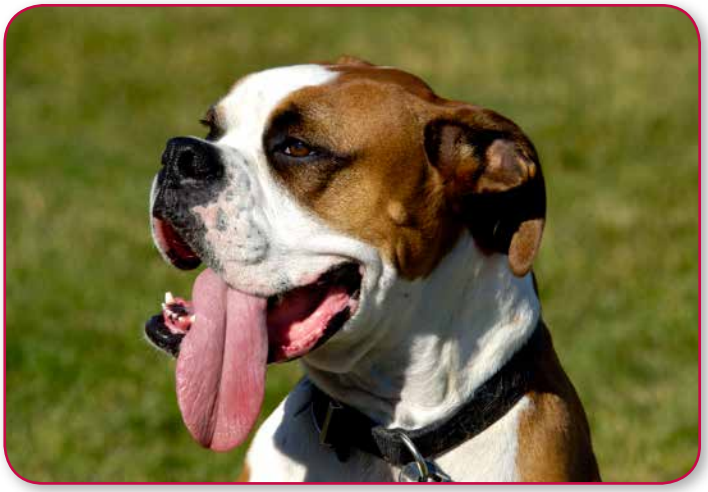
When Should I Worry About Pulmonary Hypertension In My Patient?



WHAT CAUSES PULMONARY HYPERTENSION IN DOGS?

Pulmonary hypertension (PH) is the presence of elevated pulmonary arterial pressures, either as a consequence of increased pulmonary blood flow or an increase in pulmonary vascular resistance. In the absence of significant left to right cardiac shunting (e.g. left to right shunting patent ductus arteriosus, ventricular septal defect or atrial septal defect), increased resistance to pulmonary blood flow is the chief mechanism of PH in dogs. The development of increased pulmonary resistance is mediated by either an obstruction to blood flow, or via pulmonary vasoconstriction. Intraluminal obstruction can is generally seen in cases of pulmonary thromboembolism (PTE) or secondary to other embolic factors (neoplasia, foreign bodies, parasitism). PTE is a common complication of heartworm disease, but can also be seen in a variety of metabolic diseases that increase the potential for the formation of systemic thrombi. Thrombi can also be formed locally, usually as a result of damaged endothelium. In the majority of cases, however, PH is associated with vasoconstriction of the pulmonary arteries. Pulmonary arterial vasoconstriction has a variety of causes, including primary pulmonary disease, chronically reduced pulmonary arterial oxygen tension, and pulmonary arterial constriction due to elevated pulmonary venous pressures due to left-sided heart disease, or may be idiopathic.

WHAT ARE TYPICAL CLINICAL FINDINGS IN DOGS WITH PULMONARY HYPERTENSION?

The most common manifestation of PH in animals is related to reduced pulmonary function, resulting in respiratory signs such shortness of breath, cough and increased respiratory rate or effort. Decreased forward flow due to PH can cause easy fatigue, weakness, collapse and syncope with exercise. Some patients with significant PH show no clinical signs at all. It may be difficult to discern if some of the clinical signs common in PH patients, especially coughing, are associated with elevated pulmonary arterial pressure per se, or are associated with the concurrent cardiac and respiratory abnormalities that are commonly associated with PH. Therefore, careful patient evaluation is important, including history, physical examination, and assessment of thoracic radiographs, echocardiographic findings and relevant laboratory tests.

HOW DO I DIAGNOSE PULMONARY HYPERTENSION?

Traditionally, PH is diagnosed by direct measurement of pulmonary arterial pressures using an intravenous pulmonary arterial catheter. This method requires a cardiac catheterization under anesthesia (or heavy sedation) and advanced imaging (fluoroscopy) to guide catheter placement, and is seldom used in clinical veterinary patients. More commonly, pulmonary hypertension is diagnosed using Doppler echocardiography. Analysis of tricuspid regurgitation velocity or pulmonary insufficiency velocity can be used to calculate approximate pulmonary arterial pressures. In addition, typical findings of right-sided changes due to increased resistance to ejection, including right ventricular wall thickening and right ventricular dilation, may be noted on the two-dimensional echocardiographic examination. Patients suspected of having PH should be strongly considered for referral for a high quality Doppler examination by an operator skilled in assessing two-dimensional and Doppler findings. Confirming a diagnosis of PH is the important first step in establishing a treatment protocol for these patients.

HOW DO I TREAT PULMONARY HYPERTENSION IN DOGS?

Therapy for any type of PH should begin with addressing the underlying cause, if known. In cases of PTE, the use of

anticoagulants and attempts to resolve the metabolic/anatomic derangements responsible for clot formation are going to be the most effective therapy. Eradication of heartworms, administration of anti-inflammatory agents or removal of foreign objects should be considered in affected patients. In cases in which elevated left atrial pressure (e.g. due to mitral insufficiency) is responsible for or contributing to elevated pulmonary pressure, effective therapy of left-sided heart failure, including triple therapy with furosemide, pimobendan and an angiotensin-converting enzyme inhibitor, should be initiated or optimized. Successful reduction of left atrial pressure with these medications may decrease pulmonary arterial pressure enough to alleviate clinical signs. In cases in which the PH is a result of chronic pulmonary disease or is idiopathic, and resolution of underlying may not be possible, therapy is primarily geared toward treating the underlying heart disease and palliating any primary respiratory disease.

In patients with overt clinical signs of PH (e.g. syncope) or severe PH as assessed by Doppler echocardiography, specific therapy to promote vasodilation of the pulmonary arteries is recommended in addition to treating underlying causes. In an acute decompensation situation, one of the most effective strategies to achieve pulmonary vasodilation is the use of supplemental oxygen therapy. Chronic management typically includes pulmonary vasodilating medications with minimal systemic arterial dilating effects, including phosphodiesterase V inhibitors like sildenafil, tadalafil, and vardenafil. Use of these agents often results in significant improvement in clinical signs in patients with symptomatic PH. The most commonly used medication, sildenafil, is available as a generic medication in the US, significantly decreasing the previously prohibitive cost of chronic therapy. Other phosphodiesterase inhibitors, such as pimobendan, have also been used with some success; this class of drug may be most efficacious when the PH is related to left sided heart disease.

WHAT'S THE PROGNOSIS FOR DOGS WITH PULMONARY HYPERTENSION?

The prognosis for patients with PH is variable. The response to therapy, which is often related to the underlying disease process, is likely to be the primary factor predicting the eventual outcome. Patients with treatable underlying disease processes and those with more responsive vasculature are more likely to respond to vasodilator therapy. These patients may maintain an acceptable quality of life for months to years. Underlying diseases involving irreversible damage to the lungs and pulmonary vasculature are more likely to be associated with a poor response. In these cases, patients may be oxygen-dependent and are either unable to leave the hospital or require at-home delivery of oxygen, which raises significant quality of life concerns for many owners. It can be difficult to predict which patients will respond to therapy with vasodilators, and a therapeutic trial with careful monitoring may be attempted. Patients with PH often benefit from referral for chronic management.

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