BLOOD CLOTS IN THE LUNGS (PULMONARY THROMBOEMBOLISM)

BASICS

OVERVIEW

• "Pulmonary" refers to the lungs; "thromboembolism" is a condition in which blood flow is blocked secondary to the presence of a blood clot in the artery
• Develops when a blood clot lodges in one of the pulmonary arteries and blocks blood flow to the portion of lung served by that artery

SIGNALMENT/DESCRIPTION of ANIMAL

Species

• Dogs and cats

Breed Predilection

• Disease may be more common in medium- and large-breed dogs

Mean Age and Range

• More frequently seen in middle-age to older dogs
• Bimodal age distribution (that is, having two distinct peaks of occurrence) reported in the cat, with peak occurrence in cats less than 4 years of age and in cats greater than 10 years of age

SIGNS/OBSERVED CHANGES in the ANIMAL

• Signs often reflect the primary, underlying disease
• Very sudden difficulty breathing (known as "peracute dyspnea")
• Rapid breathing (known as "tachypnea")
• Lack of appetite (known as "anorexia")
• Collapse
• Cough or spitting up of blood derived from the lungs due to pulmonary or bronchial hemorrhage (known as "hemoptysis")
• Weakness
• Exercise intolerance
• Inability to sleep or get comfortable
• Rapid heart rate (known as "tachycardia")
• Weak pulses
• Pale gums or moist tissues of the body (known as "mucous membranes")
• Bluish discoloration of the skin and moist tissues (mucous membranes) of the body caused by inadequate oxygen levels in the red-blood cells (condition known as "cyanosis")
• Pink color of the gums is slow to return when the gums are blanched by finger pressure (known as "poor capillary refill time")
• Abnormal heart sounds in severely affected animals

CAUSES

• Heartworm disease
• Cancer
• Excessive levels of steroids produced by the adrenal glands (known as "hyperadrenocorticism" or "Cushing's disease")
• Protein-losing enteropathy and nephropathy (conditions in which proteins are lost from the body through the intestines [enteropathy] or kidneys [nephropathy])
• Immune-mediated hemolytic anemia—accelerated destruction or removal of red-blood cells related to an immune response, in which the body produces antibodies against red-blood cells
• Inflammation of the pancreas (known as "pancreatitis")
• Heart disease
• Bone (orthopedic) trauma or surgery
• Generalized bacterial infection (known as "sepsis")
• Blood-clotting disorder (known as "disseminated intravascular coagulopathy" or "DIC")
• Liver disease

RISK FACTORS

• Blood-clotting disorders (known as "coagulopathies")
• Estrogen administration
• Airplane travel

TREATMENT

HEALTH CARE

- Always treat underlying disease
- Always treat patients suspected of having blood clots in the lungs (pulmonary thromboembolism) as inpatients until low levels of oxygen in the blood (known as "hypoxemia") are resolved
- Cautious administration of intravenous fluids to avoid fluid overload and possible development of right-sided congestive heart failure; "congestive heart failure" is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs
- Administer oxygen, if difficulty breathing (dyspnea) exists and/or oxygen levels in the blood are low; response to oxygen therapy is variable

ACTIVITY

- Restrict to prevent worsening of low levels of oxygen in the blood (hypoxemia) or fainting (known as "syncope")

MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Heparin is an anticoagulant (a medication to prevent blood from clotting) that may help to prevent further blood clots from developing; it will not cause existing clots to break up
- Medications to break up existing clots (known as "thrombolytic drugs," such as urokinase, streptokinase or tissue plasminogen activator) may be useful in some cases; these drugs are expensive and carry a higher risk of bleeding complications
- Warfarin (an anticoagulant)—usually indicated for long-term treatment; dosage adjustments are necessary to keep blood clotting at a specific level to prevent development of further clots, while avoiding bleeding complications
- The "low molecular weight heparins" are associated with fewer bleeding complications, require less intensive monitoring, and may be more suitable for long-term management; however, the expense of these drugs may be a limiting factor in their use

FOLLOW-UP CARE

PATIENT MONITORING

- Monitor serial arterial blood gases (measurements of oxygen and carbon dioxide levels in arterial blood) and/or pulse oximetry (a means of measuring oxygen levels in blood)—may help determine improvement in breathing function
- Check clotting status (using a blood test, known as "prothrombin time" or "PT") every 3 days initially for adjusting warfarin dosage; check weekly after an effective dosage is achieved (typically no sooner than 2 weeks)

PREVENTIONS AND AVOIDANCE

- Activity or physical therapy may improve blood flow and prevent development of blood clots in immobile patients with severe generalized (systemic) disease
- Aspirin may have some preventive role, but is inadequate as treatment; aspirin should only be administered under the direction of your pet's veterinarian
- Clopidogrel is an alternative anti-platelet drug to keep platelets from clumping together and thus decreases likelihood of clot development; it may have some role in prevention; dose not established in the dog; "platelets" are normal cell fragments that originate in the bone marrow and travel in the blood as it circulates through the body—platelets act to "plug" tears in the blood vessels and to stop bleeding; if they accumulate in a blood vessel, they may lead to a blood clot (known as "thrombosis")
- Heparin may be administered to animals that are likely to develop blood clots in the lungs (pulmonary thromboembolism) to prevent blood clots
- Alternatively, dalteparin may be used to prevent development of blood clots

POSSIBLE COMPLICATIONS

- Bleeding complications may arise in patients treated with medications to prevent blood from clotting (anticoagulant drugs)
- Death

EXPECTED COURSE AND PROGNOSIS

- Generally guarded to poor; depends on resolution of the underlying cause
- Prognosis is somewhat better for patients with blood clots in the lungs (pulmonary thromboembolism) due to trauma or generalized bacterial infection (sepsis)

KEY POINTS

- Blood clots in the lungs (pulmonary thromboembolism) are often fatal; further episodes are likely unless an underlying cause is identified and corrected; sudden death is not unusual
- Treatment with traditional medications to prevent blood clotting (anticoagulant drugs) can lead to bleeding complications, necessitating frequent reevaluation of clotting times
- Administration of medications to prevent blood clotting (anticoagulant drugs) may be required for several months, even after resolution of the causative, underlying disease