

# AORTIC THROMBOEMBOLISM

## **Definition:**

Blood clots form in and near the heart which break off and block blood vessels

## **Signs:**

Pain, collapse, difficulty breathing +/- other signs

## **Advice:**

Vet ASAP as this is a life threatening disease

## **OVERVIEW**

- “Aortic” refers to the aorta, the main artery of the body; “thromboembolism” is blockage of blood flow secondary to the presence of a blood clot in an artery
- “Aortic thromboembolism” results from a blood clot (known as a “thrombus”) that is dislodged within the aorta, causing severely reduced blood flow to the tissues receiving blood from that particular part of the aorta, leading to decreased oxygen in the tissues (reduced blood flow leading to decreased oxygen in the tissues is known as “ischemia”)
- The heart of the dog or cat is composed of four chambers; the top two chambers are the right and left atria and the bottom two chambers are the right and left ventricles

## **GENETICS**

- Although aortic thromboembolism is not commonly thought of as an inherited disease, a frequently associated disease, “hypertrophic cardiomyopathy” (a disease characterised by inappropriate enlargement or thickening of the heart muscle of the left ventricle) in cats is inherited in some breeds, and likely inherited in others
- A family of domestic shorthair (DSH) cats with hypertrophic cardiomyopathy were reported to have died from aortic thromboembolism

## **SIGNS/OBSERVED CHANGES IN THE PET**

### **Species**

- Cats—commonly associated with heart disease
- Dogs—rare; in about 40% of dogs, was associated with cancer, widespread infection, Cushing’s disease or other conditions leading to increased tendency to coagulate (known as a

“hypercoagulable state”)

### **Breed Predilections**

- Mixed-breed cats most commonly are affected
- Abyssinian, Birman, and ragdoll purebred cats were reported in one study to have a higher number of cases than would be expected normally
- In Europe, a study suggested that Cavalier King Charles spaniels may be more likely to get this problem

### **Mean Age and Range**

- Average age is approximately 8-9 years in cats, 8-10 years in dogs
- Age range is 1–20 years

### **Predominant Sex**

- Males are affected twice as frequently as females (cats)
- In the USA dog studies, no sex more affected while a European study suggested males more likely

## **SIGNS/OBSERVED CHANGES IN THE PET**

- “5-P’s”—pain, paralysis/paresis, pulse absent, pale and cold (known as poikilothermic)
- Sudden (acute) onset of weakness or paralysis, and pain are the most common clinical signs in cats, most common in the rear legs; occasionally weakness of a front leg (known as “monoparesis”), in dogs usually retain mobility, and weakness more common than full paralysis
- Lameness or gait abnormality of several weeks duration, more common in dogs
- Rapid breathing (known as “tachypnea”) or breathing distress is common in cats
- Vocalization and anxiety
- Vomiting may occur in some cats before the thromboembolism
- Absent or diminished femoral pulses (femoral arteries run down the inside of the back legs); seen where blockage occurs in the lower aorta
- Pain upon feeling the affected limbs
- Bluish or pale nail beds and footpads
- Low body temperature (known as “hypothermia”) is common in cats
- Heart murmur, irregular heartbeats (known as “arrhythmias”), or gallop sound (sequence of three heart sounds heard when listening to the heart with a stethoscope; heartbeat sounds like a galloping horse instead of normal “lub dub”)

## **CAUSES**

- Heart muscle disease (known as “cardiomyopathy”, all types)

- Increased levels of thyroid hormone in the body (known as “hyperthyroidism”)
- Cancer
- Generalized bacterial infection (known as “sepsis”) in dogs
- Increased levels of steroids produced by the adrenal glands (known as “hyperadrenocorticism” or “Cushing's syndrome”) in dogs
- Disease in which proteins are lost from the body through the kidneys (known as “protein-losing nephropathy”) in dogs

## RISK FACTORS

- Markedly enlarged left atrium or blood clot within the chambers of the heart (cats)
- In dogs, disorders that increase blood clotting (hypercoagulable)

## TREATMENT

### HEALTH CARE

- Initially, treat cats as inpatients, because many have co-existent congestive heart failure (CHF) as well as having considerable pain and distress; “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs
- Fluid therapy administered cautiously, as most affected cats have advanced heart-muscle disease; if the cat is in congestive heart failure, intravenous (IV) fluid therapy may not be necessary; congestive heart failure is a condition in which the heart cannot pump an adequate volume of blood to meet the body's needs
- Supplemental oxygen therapy or a medical procedure to tap the chest (known as “thoracocentesis”) may be beneficial, if the pet is in congestive heart failure
- Initially, the affected legs should be handled minimally; however, as blood flow returns, physical therapy (passive extension and flexion of the legs) may speed full recovery
- Initially, these cats may have difficulty posturing to urinate and may need to have their bladders expressed to prevent over distention or development of skin lesions due to contact with urine, when the hair and skin remain damp (known as “urine scald”)

### ACTIVITY

- Activity should be restricted
- Keep the cat quiet and reduce stress

### DIET

- Initially, most cats have lack of appetite (known as “anorexia”)
- Tempt these cats with any type of food to encourage them to eat

- It is important to keep these cats eating to avoid hepatic lipidosis (a disease in which fats and lipids [compounds that contain fats or oils] accumulate in the liver)

## SURGERY

- Surgical removal of the blood clot typically is not recommended as these are high-risk patients because of severe heart disease

## 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

- Medications to break up existing clots (known as “thrombolytic drugs,”); tissue plasminogen activator (TPA) are used extensively in people and infrequently in cats; these drugs are expensive, carry a significant risk for bleeding complications, and have not improved effectiveness of treatment in cats, and thus rarely are used in general veterinary practice
- Heparin is the preferred drug in general practice for cats and dogs; it has no effect on the established clot; however, it prevents further clotting
- Aspirin theoretically is beneficial during and after an episode of aortic thromboembolism because of its antiplatelet effects; “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”)—aspirin should be administered only under the direction of your pet's veterinarian; side effects may include vomiting and diarrhea
- Clopidogrel, an antiplatelet aggregation drug; it can be used alone or in combination with aspirin, superior to aspirin for prevention of re-embolization
- Buprenorphine is an opiate used to relieve pain (known as “analgesia”) and to sedate the pet; for stronger analgesia, fentanyl or hydromorphone could be used
- Acepromazine may be used cautiously for its sedative effects and to dilate blood vessels (known as “vasodilation”)
- Warfarin, a vitamin-K antagonist, is a medication that decreases blood clotting (known as an “anticoagulant”); it is used most widely in people and has been proposed for prevention of re-embolization in cats surviving an initial episode—long-term management with warfarin can be challenging because of the necessity for frequent monitoring and dose adjustments as well as side effects, such as bleeding
- Low molecular weight heparin (LMWH) recently has been proposed for the long-term prevention of feline aortic thromboembolism; LMWH has a more predictable relationship between dose and response than warfarin and does not need frequent monitoring or dose

adjustments; it also has a lower risk of bleeding complications than warfarin but is costly and needs to be injected (examples are dalteparin, enoxaparin)

- Treat the pet's heart disease; medications determined by type and severity of heart disease

## **FOLLOW-UP CARE**

### **PATIENT MONITORING**

- Electrocardiogram (ECG, a recording of the electrical activity of the heart) monitoring while the cat is in the veterinary hospital is helpful to detect heart problems with reestablishment of blood flow (known as “reperfusion injury”) and high levels of potassium in the blood (known as “hyperkalemia”)
- Monitoring blood work (electrolytes and kidney tests) periodically may be helpful to improve management of the heart disease
- The veterinarian will examine the legs frequently to assess clinical response
- Blood-clotting tests (such as activated partial thromboplastin time [APTT], prothrombin time [PT]) should be performed; decision upon which clotting test is performed and frequency of testing is determined by medication (such as heparin or warfarin) that pet is receiving

### **PREVENTION AND AVOIDANCE**

- Prevention of future blood clots in the aorta with long-term (chronic) administration of aspirin, clopidogrel, warfarin, or low molecular weight heparin is recommended strongly because of the high rate of blood-clot formation

### **POSSIBLE COMPLICATIONS**

- Bleeding associated with medications to prevent blood clotting (anticoagulant therapy)
- Permanent nervous system deficits or muscular abnormalities in the hind legs if loss of circulation prolonged during the acute episode
- Recurrent 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
- Sudden death
- Reperfusion injury and death usually associated with irregular heartbeats secondary to increased levels of potassium in the blood (known as “hyperkalemic arrhythmias”); blood flow is known as “perfusion” and the reestablishment of blood flow is known as “reperfusion”

### **EXPECTED COURSE AND PROGNOSIS**

- Expected course is days to weeks for full recovery of function to the legs
- Prognosis in general is poor for cats—in two large studies, approximately 60% of cats were

euthanized or died during the initial episode of aortic thromboembolism

- Long-term prognosis for survival varies between 2 months to several years; however, the average is approximately a few months with treatment; average survival time with concurrent congestive heart failure in cats was 77 days, without that complication, 223 days
- Predictors of poorer prognosis include low body temperature (hypothermia; less than 99°F) and 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
- Predictors of better prognosis include normal body temperature (known as “normothermia”), only a single leg affected, and presence of ability to move the leg on initial examination
- Recurrence of aortic thromboembolism is common

## KEY POINTS

- Be aware of the poor short- and long-term prognosis for cats
- Most cats will develop future blood clots
- Most cats that survive the initial episode will recover complete function of their affected legs; however, if decreased blood flow and lack of oxygen to the tissues (ischemia) was severe and prolonged, damage to parts of the lower legs or persistent nervous system deficits may result
- Cats that survive the initial episode will be on some type of medication to prevent blood clotting (anticoagulant therapy) and may require frequent reevaluations and an indoor lifestyle

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