



VETERINARY HOSPITAL & HOTEL

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Cardiomyopathy in Cats

Cardiomyopathy literally means "disease of the heart muscle." This is a disease that occurs in purebred and non-purebred cats of any age. Males and females are equally affected. There are three distinct forms and a variation of one of them. Each will be discussed separately.

Anatomy and Function of the Heart

The cat's heart is comprised of four chambers: the right and left atria (singular: atrium) (the top chambers) and the right and left ventricles (the bottom chambers). The right side of the heart receives oxygen-depleted blood from the body and pumps it to the lungs so it can receive oxygen. The left side of the heart receives oxygenated blood from the lungs and pumps it to the body. Each chamber has a valve at its opening and another valve at its exit. Each entry valve opens to allow blood to enter its chamber, and then it closes. At that precise moment, the exit valve opens and the walls of the chamber contract pushing blood out.

Cardiomyopathy principally involves the left side of the heart, the side that pumps oxygen-rich blood to the body. The left ventricle is involved first, and then the right ventricle often is affected.

Hypertrophic Cardiomyopathy

Hypertrophic cardiomyopathy (HCM) causes the walls of the left ventricle to become thicker than normal. They are normally 4-5 mm thick; however, if HCM is present they may become over 10 mm thick. As they thicken they also become stiffer and less able to contract with the force needed to send blood to the distant parts of the body. Most of the thickening that occurs in the ventricular walls is directed inward causing the left ventricular chamber to be smaller. This limits the amount of blood that can enter the left ventricle and the amount of blood that can be pumped to the body. In addition, it puts great stress on the mitral valve, the valve between the left atrium and the left ventricle. After a few weeks the valve weakens and begins to leak, creating a murmur. This murmur will often be present several weeks to months before the cat goes into heart failure and may be detected during a routine physical examination.

HCM is also a disease of humans, and 50% of the time it is an inherited disorder. There is mounting evidence that HCM in cats is also a genetic disease, especially since it is often seen in cats less than 2 years of age. It is suggested that littermates of HCM cats be tested for the disease. The diagnosis of HCM is based on several tests. Hearing a murmur or an abnormal heart rhythm is a signal that other tests should be performed. An electrocardiogram (EKG) may show abnormalities that also suggest this disease. Radiographs (x-rays) of the heart usually reveal characteristic changes in the shape of the heart, especially in the latter stages when the left atrium enlarges. However, many cats in the early stages of the disease will have normal radiographs. An echocardiogram (ultrasound study of the heart) is the most precise means of diagnosing this disease. Ultrasound waves are directed into the heart and analyzed by a computer permitting precise measurements of the thickness of the heart's walls and the size of the chambers. We can also observe the mitral valve to assess its function. Treatment is determined by the stage of the disease at the time of diagnosis. Cats in advanced disease are in congestive heart failure and treated with several drugs to keep the cat from dying. Diltiazem is used to relax the walls of the left ventricle so more blood can enter and so it can contract with more force. Propranolol is used to slow the heart rate when it is beating too fast. Furosemide is a diuretic that stimulates the kidneys to remove fluid that may have collected in the lungs (pulmonary edema). Aspirin is used to prevent blood clots that often form around the mitral valve. Eventually, they dislodge from the valve and cause obstruction of arteries in various parts of the body. Enalapril is a new drug used for this disease. One study has shown that its use may result in thinning of the left ventricular walls and even return to normal thickness in some cats. However, this drug takes 2-4 months to cause these results. If HCM is detected before the onset of congestive heart failure, enalapril and aspirin may be the only drugs that are needed. However, because the disease appears to be genetically caused, it is thought that enalapril probably should be given for the rest of the cat's life to prevent recurrence.

The prognosis is largely dependent on when the disease is diagnosed and how successful treatment is in correcting congestive heart failure. If it is diagnosed early or if congestive heart failure is controlled, many of these cats live for several years.

Dilated Cardiomyopathy

Dilated cardiomyopathy (DCM) results in thinning of the walls of the left ventricle. Instead of being 4-5 mm thick, they may become only 1-2 mm thick. As they become thinner they also stretch and become unable to contract properly. This results in enlargement (dilation) of the left ventricle. Even though more blood can enter the ventricle, the walls become so weak that they cannot pump the blood with enough force to send it to the distant parts of the body. The end result is congestive heart failure. In the 1980's, DCM was almost as common as HCM. However, it was discovered that a deficiency of the amino acid taurine was the cause of this disease in many cats. Cat food manufacturers were notified that cats need more taurine than was previously thought, and they responded by increasing its level in commercial cat foods. Consequently, DCM has almost disappeared. However, it is still seen in cats that eat primarily dog food or table food and occasionally in cats that eat commercial cat food. The latter causes us to realize that taurine deficiency is not the only cause of this disease, although other causes are not known at this time.

The diagnosis of DCM is based on several tests. An electrocardiogram (EKG) may show abnormalities that suggest this disease, although most of these cats have normal EKG's. Radiographs (x-rays) of the heart often reveal characteristic changes in the shape of the heart, especially in the latter stages when the left ventricle is markedly enlarged. However, many cats in the early stages of the disease will have normal radiographs. An echocardiogram (ultrasound study of the heart) is the most precise means of diagnosing this disease. Ultrasound waves are directed into the heart and analyzed by a computer permitting precise measurements of the thickness of the heart's walls and the size of the chambers. Treatment consists of drugs to control heart failure. Digoxin is usually used to cause an increase in the force of the contractions of the walls of the left ventricle. Furosemide is a diuretic that stimulates the kidneys to remove fluid that may have collected in the lungs (pulmonary edema). Aspirin is used to prevent blood clots that often form around the mitral valve. Eventually, they dislodge from the valve and cause obstruction of arteries in various parts of the body. Enalapril has shown some promise in treating this disease even though the mechanism of action is not understood at this time. Unfortunately, we do not have a drug that reverses the thinning of the left ventricular walls. Therefore, the long-term prognosis is not very good in many of these cats.

Restrictive Cardiomyopathy

Restrictive cardiomyopathy (RCM) is an uncommon variation of HCM. The walls of the left ventricle are thickened in some areas and not in others; they also become very stiff. One distinct difference is the presence of inflammation in the walls of the left ventricle. This finding raises the question of some type of infection as a possible cause of this disease. RCM progresses to congestive heart failure, just as the other types. A murmur is common, and the left atrium often dilates. Treatment is much the same as HCM, but the results are often not as good. Enalapril has not been used on enough of these cats to determine its effect.

Thyrotoxic Cardiomyopathy

Thyrotoxic cardiomyopathy is a very mild form of cardiomyopathy compared to the others. This disease is the result of another disease of cats, hyperthyroidism. Hyperthyroidism results in thyroid gland enlargement and overproduction of thyroid hormone. Excess thyroid hormone stimulates the heart resulting in mild thickening of the left ventricular walls. However, in this disease the force of heart contractions is usually greater than normal and these cats often have high blood pressure. Thyrotoxic cardiomyopathy resolves when hyperthyroidism is treated; therefore, it has a very good prognosis if proper treatment for its underlying disease occurs.

Blood Clots

When the heart is functioning normally, blood flows through it in a laminar (straight path) fashion. Each of the forms of cardiomyopathy cause abnormal flow patterns, especially around the mitral valve. This often results in blood clot formation on the valve. These clots get larger and larger until parts of them break off and are carried with the blood into the aorta and other major arteries. Most commonly, a clot will be carried down the aorta toward the rear legs. When the aorta splits to go to the rear legs, each new artery is smaller than the aorta, much like a tree that branches. The clot then is too large to continue down either artery so it suddenly stops, usually in such a way that blood flow is prohibited to the main artery of each rear leg. Suddenly, the cat is in severe pain and cannot use either rear leg. Within a few minutes to hours the feet become cold and the pads become bluish. This creates a severe crisis for the cat. It cannot walk on its rear legs, and it is in a great deal of pain. The clot that obstructs these arteries is commonly called a saddle thrombus.

Fortunately, there are other arteries that go to the rear legs. Although they are not as large, they are able to supply enough blood to the legs to keep the tissues from dying, in most cases. Over the next 5-10 days, these smaller arteries send new branches to the blood-deprived parts of the legs. During that time, various drugs are used to make the cat more comfortable, and massage and physical therapy are performed to support the muscles until they become functional again. The vast majority of cats will regain their ability to walk.

Surgery has been performed on some of these paralyzed cats to remove the blood clot. Sometimes the surgery is very successful, and the cat resumes walking almost immediately. However, the underlying disease that causes the blood clot to form is cardiomyopathy, so many of these cats will die during surgery because of heart failure.

Blood clots may obstruct other arteries. If one enters the renal (kidney) artery, kidney failure will result. If one goes to a front leg, lameness (but usually not paralysis) will occur. If one goes to the brain, a seizure or stroke is likely.

We do not have a drug that will dissolve the blood clots on the mitral valve or in the smaller arteries. However, aspirin is used to prevent their formation. The average 10-pound cat should receive an 81 mg aspirin 2-3 times per week (every 2-3 days). Eighty-one milligram aspirin is sold as "children's aspirin" or "low-dose adult aspirin." Children's aspirin (formerly known as baby aspirin) is usually chewable and orange flavored, a taste that is generally objectionable to cats. Low-dose adult aspirin is often enteric (hard) coated and more easily swallowed; that works best for most cats.

You may have heard that aspirin should never be given to a cat. Obviously, that is not a true statement. However, cats are able to break down aspirin very slowly. One dose remains in the cat's body for 48-72 hours. Therefore, as long as the dose is correct and the dosing interval long enough, it is very safe.

DO NOT SUBSTITUTE ACETAMINOPHEN (TYLENOL) FOR ASPIRIN. ACETAMINOPHEN IS VERY TOXIC TO CATS.

Warfarin is another drug that may also be used to prevent blood clots. It appears to be somewhat more effective than aspirin in some cats, but overdosing results in severe bleeding. Therefore, its use requires very careful monitoring of the cat's blood clotting ability.