Cardiomyopathy (Heart Disease) in Cats

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What is Cardiomyopathy?

Cardiomyopathy is the name given to any disease affecting the heart muscle itself.

- Hypertrophic cardiomyopathy (HCM) – this is the most common form of heart disease in cats and occurs where there is an increase in the thickness of the muscular wall of the heart. This reduces the volume of blood within the heart and also prevents the heart muscle relaxing properly between contractions.
- Dilated cardiomyopathy (DCM) – this is where the muscular wall of the heart generally becomes thinner than usual, the heart enlarges, and the heart muscle cannot contract effectively.
- Restrictive cardiomyopathy (RCM) – here primarily there is fibrosis of the wall of the heart, making it stiff and inelastic, so preventing the heart chambers filling normally.
- Intermediate cardiomyopathy (ICM) – these cases have changes consistent with more than one type of disease – for example a mixture of both hypertrophy and dilatation present.

What causes Cardiomyopathy?

In the majority of cases of heart disease in cats the cause is unknown, however, in some cases there are various recognised causes. Known potential underlying causes include:

- Cardiomyopathy secondary to other diseases
- Hyperthyroidism (overactive thyroid glands)
- Hypertension (high blood pressure)
- Acromegaly (excessive growth hormone production)
- Nutritional causes
- Taurine deficiency (causing dilated cardiomyopathy)
- Infiltration of the heart muscle
- Lymphoma (a type of malignant tumour)
- Exposure to toxins
- Some drugs may have secondary effects on the heart
- Hereditary causes
- Genetic defects that may contribute to development of cardiomyopathy have been recognised in Maine Coon cats and other breeds

What happens in cardiomyopathy?

In cardiomyopathy, the underlying abnormality of the cardiac muscle leads to a compromise in cardiac function. The alteration in heart function depends on the type of cardiomyopathy though:

- With HCM and RCM the disease mainly interferes with the ability of the heart muscle to relax properly between contractions. The relaxation phase between each cardiac contraction is called diastole, and if this does not occur properly, the heart cannot fill with blood so effectively. If severe, this will lead to heart failure, and a form known as *'diastolic heart failure'*.

- With DM the disease mainly affects the ability of the heart muscle to contract (called *'systole'*). This will compromise the ability of the heart to pump (and eject) blood. In severe cases this too leads to heart failure, a form known as *'systolic heart failure'*.

Early signs of heart disease

In the initial phase of disease, cats may show no signs at all and appear completely normal. In fact a number of cats with cardiomyopathy may never actually develop clinical disease. However, while in some cats progression of the underlying disease is slow, in others it can be quite rapid.

Some early signs of heart disease may be detectable during a clinical examination:

- Presence of a heart murmur – this is an abnormal noise that can be detected when listening to your cat's heart with a stethoscope and develops due to turbulence in the flow of blood through the heart.

- Presence of a gallop rhythm – normally you can hear two sounds when you listen to the heart with a stethoscope (these sounds are associated with closure of heart valves during contraction and relaxation of the heart). With significant heart disease, a third audible heart sound is sometimes detected and this is referred to as a *'gallop sound'* or *'gallop rhythm'*.

- Abnormalities in heart rate – with heart disease, the heart rate can sometimes significantly increase or decrease outside of the normal range. Sometimes there may be heart beats without any effective flow of blood (a heart beat but no pulse detectable in an artery, known as a *'pulse deficit'*).

- Presence of cardiac rhythm disturbances – these are also referred to as cardiac arrhythmias. Normally, cats have a very regular heart rate, however, with heart disease there can be interference in the normal electrical impulses that control heart contractions. This can lead to disturbances to the normal rhythm.

Many cats, especially those in the early stages of disease, may only have changes in the cardiac muscle that are detected during an ultrasound examination of the heart. These cats are clinically silent (or asymptomatic), although many will go on to develop signs later on.

Heart failure

If heart function is significantly impaired by cardiomyopathy, heart failure, often called congestive heart failure, may develop, where there is compromise to blood flow through the heart and blood output from the heart.

Cats can sometimes develop clinical signs without prior warning, and some cats can deteriorate very rapidly. Some cats with heart disease show signs of collapse, or 'fainting'. However, this is relatively uncommon and usually associated with marked disturbances to the normal rhythm of the heart. Abnormal rhythm can lead to episodes where the brain is starved of oxygen through poor blood flow.

Unlike dogs, cats are not often 'exercised' (e.g. taken for walks on a lead) so it is often much more difficult to detect that they have reduced exercise ability – often an early sign of heart disease. Cats are likely just to spend a little more time resting or sleeping and this may not be very obvious. Detecting early disease is often especially difficult, as cats are good at hiding signs of disease. Additionally, there may be no obvious signs until a 'critical point' is reached due to advancement of the disease or due to stress (which may result in sudden or rapid development of quite marked signs).

In cats, the most commonly seen sign of heart failure is the development of difficult breathing (*dyspnoea*) and/or more rapid breathing (*tachypnoea*). This is generally caused by either a build up of fluid in the chest cavity around the lungs (called a pleural effusion), or due to a build up of fluid within the lungs themselves (called pulmonary oedema).

Along with breathing difficulties, cats may have cold extremities (e.g. ears and paws), and may have pale mucous membranes (gums and eyes) suggesting poor circulation. Occasionally the mucous membranes of the mouth and eyes, and even the skin, may show signs of cyanosis (a bluish colour). Coughing is rarely seen in cats with heart disease, although it is quite common in dogs. If coughing is seen in cats, it is more likely to be caused by a disease of the airways (such as bronchitis).

Feline Aortic Thromboembolism (FATE)

Another sign which can occur in cats, and may sometimes be the first indicator of underlying heart disease, is the development of what is known as *'Feline Aortic Thromboembolism'* or FATE. A thrombus (blood clot) may develop within one of the heart chambers (usually the left atrium) in a cat with cardiomyopathy. This occurs mainly because the blood is not flowing normally through the heart. The thrombus, or clot, is initially attached to the wall of the heart, but may become dislodged and be carried into the blood leaving the heart. A thrombus that moves into the blood circulation is called an embolus, hence the term *'thromboembolism'*. Once in circulation, these emboli can lodge in small arteries and obstruct the flow of blood to regions of the body. Although this can happen at a number of different sites, it more commonly occurs towards the end of the major artery that leaves the heart (the aorta) as it divides to supply blood to the back legs. This complication is seen most commonly with HCM, and will cause a sudden onset of paralysis to one or both back legs, with severe pain and considerable distress.

How do we diagnose cardiomyopathy?

Various diagnostic tests can be done to assist the diagnosis of heart disease in cats.

- Electrocardiogram (ECG) – this is an electrical trace of the heart activity. It can be very useful for detecting cardiac rhythm disturbances.
- Radiography (X-rays) – are helpful for showing changes in the overall shape and size of the heart, and for detecting a build up of fluid (pulmonary oedema or pleural effusion). Repeating radiographs may also allow monitoring of the efficacy of any treatment.
- Heart ultrasound (echocardiography) – is very helpful as the internal dimensions of the heart, the wall thickness, and the contractility of the heart can be measured. It can also show where a heart murmur is originating from. This is the only test which can readily distinguish between different types of heart disease in cats. Although a small area of skin usually needs to be shaved to perform ultrasound, the procedure is not uncomfortable or painful and so can be performed in most cats with light sedation.
- Tests for underlying disease – may need to be performed in some cases, including blood tests and blood pressure measurement.

Treatment

The underlying cause of cardiomyopathy is often difficult to treat. If underlying causes such as Taurine deficiency in the diet, hypertension (high blood pressure) or hyperthyroidism (overactive thyroid gland) are identified, treating these diseases may improve cardiac function.

When heart failure develops, various drug treatments can be used to help improve and manage the condition. These may include:

- Beta-blockers such as Atenolol, which slow down the heart rate and reduce the oxygen demand on the heart.
- ACE-inhibitors (angiotensin-converting enzyme inhibitors, e.g. Benazepril, Ramipril, Enalapril) or ARBs (angiotensin receptor blockers, e.g. Telmisartan) help block activation of the renin-angiotensin-aldosterone system (RAAS), a hormone system stimulated in cats with heart disease. Their use may help in the management of heart failure and possibly also in the early stages of heart disease.
- Pimobendan is a calcium channel sensitiser. It increases the strength of the contraction of the heart and also acts to dilate blood vessels which may help the flow of blood. It has been used in some cats with congestive heart failure.
- Diuretics (such as Frusemide/Furosemide) are extremely valuable once signs of congestive heart failure develop. They help remove fluid build up in or around the lungs. Dosage can be adjusted over quite a wide range to achieve the desired result.

Unfortunately the true effectiveness of many drugs in treating heart disease in cats is unknown, and more clinical trials are needed. Different drugs also act in different ways, and so may be helpful in different situations. In general, diuretics are the most useful drugs used to manage signs of congestive heart failure.

Drugs are also often used to try to prevent Feline Arterial Thromboembolism. Cats with cardiomyopathy are at risk of developing blood clots which can block vital blood vessels in the same way a blood clot may cause a stroke in humans. Clopidogrel and Aspirin are the most commonly used medications.

Sleeping respiratory rate

Taking the sleeping respiratory rate (SRR) of cats can be useful to assess if congestive heart failure is present or to adjust the dose of diuretics. Count the number of breaths (in and out being one breath) for 30 seconds then double the result. Normal cats will have a rate less than 30-40 breaths per minute.

Keeping an SRR rate diary can be very useful for assessing early onset of congestive heart failure or adjusting the diuretic dose given.