

Dilated Cardiomyopathy and Heart Failure in Dogs

The heart has four chambers. The upper chambers are called atria (singular: atrium), and the lower chambers are called ventricles. In addition to the upper and lower chambers, the heart is also considered to have a right and a left side.

Blood flows from the body into the right atrium. It is stored there for a few seconds, then pumped into the right ventricle. The right ventricle pumps blood into the lungs, where it receives oxygen. It flows from the lungs into the left atrium; it is held here for a few seconds before going into the left ventricle. The left ventricle contains the largest muscle of the heart so the blood can be pumped out to all parts of the body.

Dilated cardiomyopathy (DCM) means that the heart muscle, called the myocardium, becomes much thinner than normal. In particular, the thick muscle wall of the left ventricle is affected. The pressure of the blood inside the heart allows this thinned wall to begin to stretch, resulting in a much larger left ventricular chamber. Therefore, the two characteristics of dilated cardiomyopathy are a heart wall that is much thinner than normal and a chamber that is much larger than normal.

Prevalence

Primary dilated cardiomyopathy is the most common cause of heart failure in *large breeds* of dogs. Small breeds are only occasionally affected. The most commonly affected breeds are Boxers, Doberman Pinschers, and Great Danes. Occasionally, medium sized breeds, notably Cocker Spaniels and English Springer Spaniels, develop this condition.

Causes/Transmission

In some cases, DCM develops secondary to a chemical toxicity, nutritional deficiency, or inflammatory condition in the heart. Doxorubicin, a drug commonly used in chemotherapy, can induce DCM after repeated administration. Nutritional deficiencies of carnitine and taurine have been linked with DCM, although this cause is uncommon in dogs. Some non-cardiac conditions, such as pancreatitis and electrical shock, have occasionally been found as a cause of DCM.

Unfortunately, for most dogs, the cause is unknown. This is called primary or idiopathic (cause unknown) DCM.

Clinical Signs

When the heart begins to fail, it is unable to deliver adequate oxygen to all the tissues of the body. This sets into motion a series of compensatory events. In other words, the body's cells become desperate and trigger a series of responses. Various hormones are released by several organs in an attempt to correct the problem. These hormones conserve fluid in an effort to increase blood volume and the output of blood and oxygen by the heart.

For several months, these compensatory responses help the situation. However, the increased fluid retention eventually becomes harmful. Perhaps the most detrimental event occurs when this excessive fluid leaks out of the pulmonary (lung) capillaries and into the air spaces (alveoli) of the lung; this is called *pulmonary edema*. This fluid collection in the lungs produces very obvious signs and may be one of the first things an owner might notice. Noticeable signs include weakness, coughing or gagging, fainting or collapse, and obvious exercise intolerance.

Fluid may also collect in the abdominal cavity and body tissues. Fluid within the abdominal cavity is called ascites. Fluid in the tissues of the legs is called peripheral edema. Congestive heart failure is a common cause of these signs.

Dilated cardiomyopathy may have a very sudden onset. Some dogs go into severe heart failure in what appears to be a matter of hours. Rapid, heavy breathing, a blue tongue, excessive drooling, or collapse may be the first signs.

Diagnosis

There are several tests that are used to look at different aspects of the heart's structure and function.

1. Auscultation (listening with a stethoscope). This valuable tool allows us to identify murmurs, their location, and their intensity and an abnormal heart rhythm (arrhythmia). It also allows us to hear lung sounds; this aids in our understanding of what is happening within the lungs. However it cannot assess the size or strength of the heart muscle
2. Blood and urine tests. These do not give direct information about heart function, but they allow us to understand other disorders in the body that may impact on heart function and treatment of heart disease.
3. Chest radiographs (x-rays). These give us the best look at the lungs and a view of the size and shape of the heart. In most cases, dilated cardiomyopathy causes tremendous enlargement of the heart. These changes are usually very apparent on the x-rays.
4. Electrocardiogram (ECG or EKG). This is an assessment of the electrical activity of the heart. It allows us to accurately determine heart rate and to more accurately identify any abnormal heart rhythms that might be present.
5. Ultrasound examination (sonogram, echocardiogram). This examination uses sound waves that bounce off the structures of the heart and are read on a TV-like monitor. It gives the most accurate determination of the size of each heart chamber, and permits measurement of the thickness of the heart walls. This is seen on the monitor in actual time so the contractions of the heart can be evaluated. Certain measurements can be taken which allow the actual strength of the heart's contraction to be measured as a number and compared to the normal animal.

The combination of all of these tests gives us our best evaluation of the dog and its heart function.

Therapy

If the dog has a sudden onset of heart failure, rapid administration of appropriate medication is essential to survival. The following drugs may be used at various stages of treatment. Initial stabilization usually depends on the first two.

1. Diuretics. These drugs stimulate the kidneys to remove excess fluid from the body. Furosemide is most commonly used, although others will be selected in certain circumstances.
2. Nitroglycerin. This drug is called a venodilator; it dilates the veins throughout the body, especially the ones going to the heart muscle. It decreases the amount of blood returning to the heart by allowing some of it to "pool" in the veins. This temporarily reduces the workload of the heart. This class of drugs can be very useful for treating pulmonary edema.
3. Enzyme blockers. This class of drugs can help modulate the imbalance of hormones related to heart failure. ACE-inhibitors, such as enalapril, are the most commonly used drugs.
4. Pimobendan: This is a newer drug that has 2 effects. It works at the heart to help the heart beat stronger (positive inotrope). It also works on the blood vessels to help them relax (venodilator) so the heart doesn't have to work as hard to pump the blood. The brand name for Pimobendan is Vetmedin.
5. Anti-arrhythmics: These drugs help the heart to beat normally and control any abnormal or irregular rhythms. There are several different anti-arrhythmics. Which one is prescribed to your dog depends on the type of irregular rhythm it has and how it tolerates any side effects of the drug.

Prognosis

There are many factors that must be considered before that question can be answered. The results of the tests are important, and the response that occurs within the first few days is another indicator.

If response does not occur within a few hours to days, the prognosis is guarded to poor. However, most dogs that stabilize quickly will live for a period of a few months to many months, but the long-term prognosis remains unfavorable.