

## Degenerative Valve Disease of the Heart

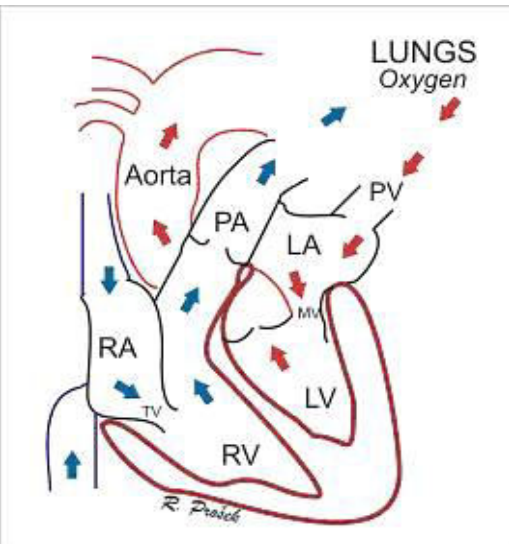


Figure 1. Blue arrows represent deoxygenated blood flowing through the right side of the heart to the lungs, where red arrows represent oxygenated blood leaving the lungs through the left side of the heart. RA = right atrium, RV = right ventricle, TV = tricuspid valve, PA = pulmonary artery, PV = pulmonary vein, LA = left atrium, MV = mitral valve, LV = left ventricle.

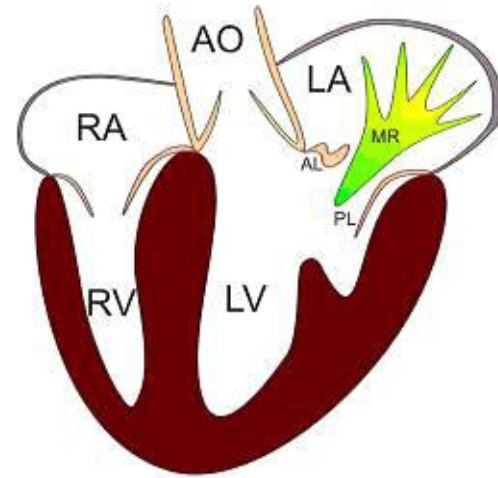


Figure 2. Graphic representation of mitral valve insufficiency (regurgitation). RA = right atrium, RV = right ventricle, AO = aorta, LA = left atrium, LV = left ventricle, MR = mitral regurgitation, AL = anterior mitral leaflet, PL = posterior mitral leaflet

### How Does the Heart Work?

The heart is the organ responsible for pumping blood to and from all tissues of the body. The heart is divided into right and left sides. The job of the right side is to pump oxygen-deficient blood returning from the body into the lungs to be re-oxygenated, and to get rid of the carbon dioxide that the body produces. Returning from the lungs, the now-oxygenated blood enters the left side of the heart where it is pumped out into the aorta and to the body via the arterial system.

Each side of the heart also has two chambers, an upper atrium and a lower ventricle. Between the atrium and ventricle on each side lies a valve – the tricuspid on the right and the mitral on the left – that regulates blood flow into the chambers. As the heart pumps, these valves act as one-way gates allowing blood to flow from the atrium above to the ventricle below and preventing blood from flowing back into the atrium. From the ventricles, blood is then forced to flow out into the pulmonary artery (on the right) or the aorta (on the left) through a second series of one-way valves called the pulmonic valve and the aortic valve.

## What is Degenerative Valve Disease?

Degenerative valve disease (DVD), also called endocardiosis, valvular regurgitation, valvular insufficiency or chronic valve disease, refers to a noninfectious degeneration of the cardiac valves. In dogs and cats, the most commonly affected valve is the mitral valve (on the left side of the heart), followed by the tricuspid valve on the right side. The pulmonic and aortic valves are rarely affected by this condition. For reasons we don't completely understand, the mitral or tricuspid valve leaflets can become abnormally thickened and develop a nodular appearance in some breeds (see below). These, and other changes to the valves, impede their ability to form a tight seal between the atrium and ventricle during systole (contraction of the heart muscle), and they begin to leak. As a result, some of the blood in the ventricle now flows back into the atrium through the leaky valve (known as regurgitation) instead of moving forward from the ventricle into the aorta (on the left side) (Figure 2) or pulmonary artery (on the right side) with each beat. The consequences of this are discussed below.

## What Animals are Affected By DVD?

Degenerative valve disease accounts for about 75% of cardiovascular disease in dogs. Approximately 60% of affected dogs have degeneration of the mitral valve, 30% have lesions in both the tricuspid and mitral valve leaflets, and 10% have only tricuspid valve disease. In dogs, the disease is age and breed-related, with older, small-breed dogs demonstrating a higher incidence. There is also a slight predisposition among male dogs.

Miniature poodles, Cocker Spaniels, Miniature Schnauzers, and Dachshunds are the most commonly affected breeds. Cavalier King Charles Spaniels, another commonly affected breed, tend to develop DVD earlier in life with a faster progression than the other small breed dogs. Terrier breeds are also commonly seen with DVD. Larger breeds are also affected by this disease (most commonly the mitral valve leaflets) although much less often. Degenerative valve disease is uncommon in cats.

## How Does DVD Affect Your Dog?

The outcome of DVD in dogs depends on the severity of the condition. The clinical signs depend on which valve is affected.

The regurgitation of blood due to DVD causes a murmur ([abnormal heart sound](#)) when your veterinarian listens to your dog's heart. Murmurs due to mitral and/or tricuspid regurgitation are much more common than clinical signs related to the disease. Many patients develop only mild and slowly progressive valvular lesions that have no effect on the patient's quality of life.

However, when mitral regurgitation is substantial, the flow of blood back into the left atrium results in a blood volume overload inside the left atrium and left ventricle, causing these chambers to get bigger as they attempt to accommodate the extra blood. If the regurgitation is severe, then the chamber enlargement reaches a limit and the pressure inside these chambers begins to increase. If the left atrial pressures become significantly high as a result of increased blood volume, fluid within the lung vessels (which are connected to the left atrium) begins to leak out, resulting in clinical signs of congestive heart failure (also known as pulmonary edema).

Congestive heart failure due to DVD of the mitral valve usually presents as coughing, shortness of breath and rapid breathing. The generalized decrease in effective forward circulation of blood to the tissues of the body may also manifest as lethargy, exercise intolerance, lack of appetite, or weight loss.

Tricuspid valve DVD has a similar course of events as mitral valve DVD, but instead of fluid building up in the lungs (pulmonary edema), fluid builds up in body cavities: abdomen, pleural space (chest cavity). Dogs with right-sided congestive heart failure tend to develop a grossly distended abdomen. This can cause some discomfort, especially when lying down, and can cause a shortness of breath, especially when sleeping or resting.

## How is the Valve Disease Treated?

Treatment of DVD centers on eliminating signs of congestive heart failure. Drugs commonly used are diuretics ([furosemide](#), torsemide, hydrochlorothiazide, spironolactone), angiotensin converting enzyme inhibitors ([enalapril](#), [benazepril](#), ramipril), afterload reducers ([amlodipine](#), hydralazine), digoxin and newer inodilator drugs, such as [pimobendan](#). With right-sided congestive heart failure (fluid in the abdomen or chest cavity), repeated physical removal by your veterinarian is often the best option.

## Can I Slow Down or Reverse the Progression of DVD in My Pet?

Several trials have looked at preventing DVD from progressing to the point of congestive heart failure. Unfortunately, no drugs that have been looked at have proven effective in either preventing or slowing down progression of DVD. As new drugs are developed, these will also undergo testing, so there may be drugs in the future that could help with DVD progression.

## Can Diet Help?

Some animal diet manufacturers have developed heart-specific diets that are moderately restricted in salt. However, while these diets are unlikely to be harmful, they have not been shown to affect progression of the disease or control of clinical signs.

## Is There Surgery to Correct DVD?

Several devices are being developed to address DVD. One of these is a device that is placed on the outside of the heart (epicardial annuloplasty device) and has shown great promise in the research setting. Clinical trials of this device start in March 2015. The device will likely be on the market within a few years. Other devices involve creating a prosthetic valve. These are still being evaluated in research animals, rather than pets.

In human medicine, valve replacement or repair is a common surgical procedure. Unfortunately, surgical exposure of the mitral or tricuspid valves requires cardiopulmonary bypass. Although currently being performed by a few veterinary surgeons around the world, bypass surgery is difficult to perform in small animals. Costs for valve repair/replacement are approximately \$10,000. There are limitations on the types of patients that are suitable for surgery. If you wish to investigate the possibility of surgical correction, discuss this with a veterinary cardiologist.

Heart transplants are not an option in dogs because it would require killing a healthy dog to obtain its heart – something that is considered unethical by the veterinary profession.

## What Should You Monitor at Home?

It is important that you monitor your pet's overall attitude and any change in behavior. It may also be helpful for you to keep a record of your pet's respiratory rate (number of breaths per minute) so that you will notice increases or changes from normal breathing. Normal dogs, and dogs with well controlled heart disease usually have a breathing rate of one breath every 2 to 3 seconds (20-30 breaths/min). If breathing rates are much higher than this, or if you notice any of the following signs, please contact a veterinarian immediately:

- heavy, labored, or rapid breathing
- increased coughing
- fainting spells
- restlessness
- anorexia
- resting respiratory rate greater than 40 breaths per minute. A handy app for this is called Cardailis and is free for both iPhone and android platforms.