

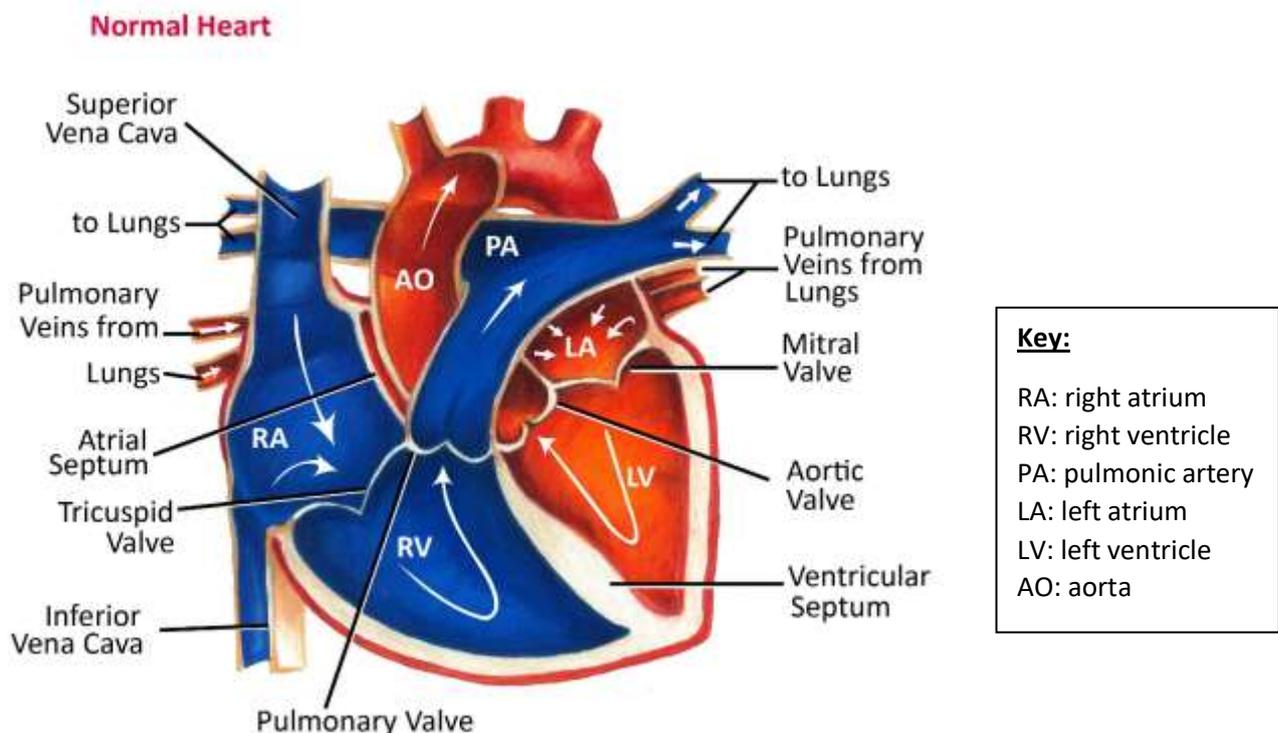


Atrioventricular Valve Dysplasia

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 where fresh oxygen is collected and carbon dioxide is removed. The oxygen-rich blood returning from the lungs enters the left side of the heart where it is pumped into the aorta then to the rest of the body via the arterial system.

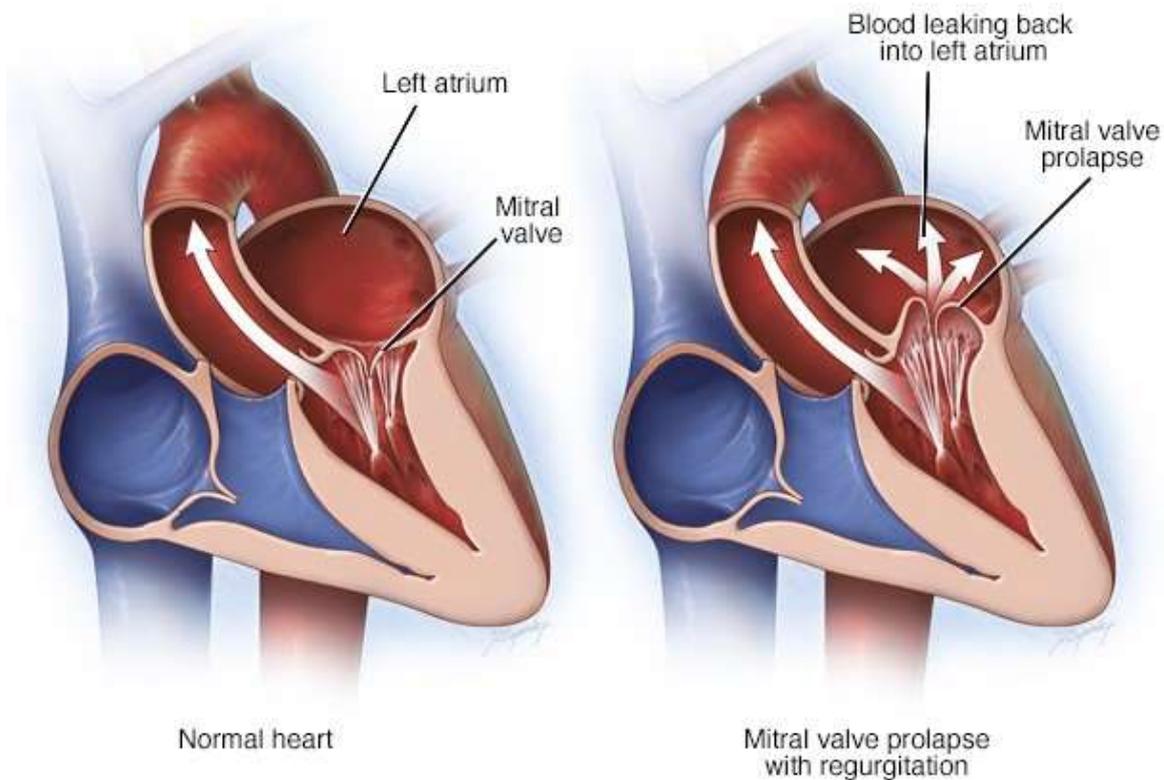
Each side of the heart has two chambers, an upper atrium and a lower ventricle. Between the atrium and ventricle on each side lies a valve – the tricuspid on the right and the mitral on the left – that regulates blood flow into the chambers. As the heart pumps, these valves act as one-way gates allowing 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, respectively. The region immediately before the pulmonic and aortic valves is called the ventricular outflow tract (this is the narrowest part of both ventricles).

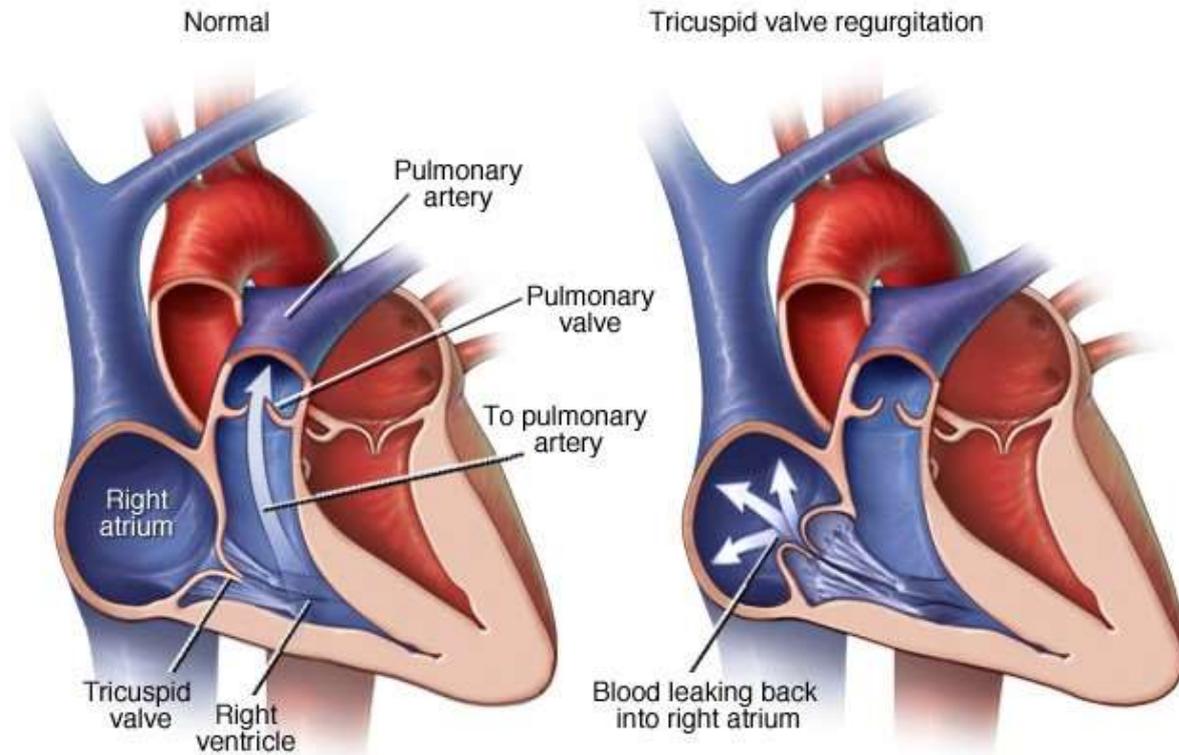




What is AV Valve Dysplasia?

Atrioventricular (AV) valve dysplasia, refers to congenital (in-born) abnormalities of the AV valves (the mitral and/or tricuspid valve). The abnormalities of the valves may include thickened and irregular valve leaflets. 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 subsequently 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) or pulmonary artery (on the right side) with each beat. The consequences of this are discussed below.





A variation of mitral valve dysplasia is seen in some dogs. Instead of the primary consequence being a leaky mitral valve, occasionally the septal leaflet of the mitral valve (the larger leaflet) can 'flick' up into left ventricular outflow tract and create an obstruction to blood flow. This narrowing or obstruction is referred to as dynamic, meaning it is not of a fixed severity; it can change with heart rate. The result of this obstruction depends on the severity and duration, however in more significant cases the left ventricular muscle grows and thickens (the consequences of this are discussed below).

Rarely, AV valve dysplasia may result in valves that do not open properly (this is called stenosis and will not be discussed any further in this handout).

What animals are affected by AV Valve Dysplasia?

Mitral and tricuspid valve dysplasia can occur in any dog breed however some breeds are considered predisposed. Such a predisposition suggests a genetic/heritable basis in these breeds.

Breeds more commonly recognised with mitral valve dysplasia include Bull Terriers and German Shepherds.



The breed by far most commonly diagnosed with tricuspid valve dysplasia is the Labrador Retriever. It has been shown to have a genetic basis in this breed.

AV valve dysplasia is also recognised with some frequency in cats.

How does AV Valve Dysplasia affect your pet?

The outcome of AV valve dysplasia depends on the severity of the condition. The clinical signs depend on which valve is affected.

The regurgitation of blood due to AV valve dysplasia causes a murmur (abnormal heart sound) when your veterinarian listens to your pet's heart. Murmurs due to mitral and/or tricuspid regurgitation are more common than clinical signs related to the disease. Some patients have only mild valvular lesions that do not result in clinical signs or affect 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). This causes these chambers to enlarge as they attempt to accommodate the extra blood. If the regurgitation is severe, chamber enlargement reaches a limit and the pressure inside these chambers begins to increase. Once a critical pressure is reached, fluid within the lung vessels (which are connected to the left atrium) begins to leak out (pulmonary oedema), resulting in clinical signs of left-sided congestive heart failure (CHF).

Left-sided congestive heart failure (CHF) usually presents as rapid breathing and laboured breathing (contrary to popular belief, coughing is not a common clinical sign of congestive heart failure in dogs or cats). With more advanced disease, generalised decrease in forward circulation of blood to the body can result, which may manifest as lethargy, exercise intolerance, lack of appetite and/or weight loss.

Dogs with the variant of mitral valve dysplasia discussed above, with a mitral valve that obstructs blood leaving the heart, can also develop congestive heart failure. In severe cases, the thickening of the left ventricle that results, makes it difficult for the ventricle to fill with blood. Eventually this causes enlargement of the left atrium and left-sided congestive heart failure ensues.

Tricuspid valve dysplasia has a similar course of events as mitral valve dysplasia, but instead of fluid building up in the lungs (pulmonary oedema), fluid builds up in body cavities: abdomen and less commonly the 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, particularly when sleeping or resting.



How is AV Valve Dysplasia diagnosed?

Although there are many diagnostic modalities for heart disease, the only way to make a definitive diagnosis of AV valve dysplasia is using echocardiography (cardiac ultrasound). Ultrasound allows us to look inside the heart and hence visualise the abnormal valves. Thoracic radiographs (x-rays) may be suggestive of a AV dysplasia however cannot be used to make a definitive diagnosis (they are however very useful to confirm the presence of left-sided CHF).

How is AV Valve Dysplasia treated?

Treatment of AV valve dysplasia is predominantly aimed at eliminating signs of congestive heart failure. Drugs commonly used include diuretics (frusemide, spironolactone), angiotensin converting enzyme inhibitors (benazepril, enalapril) and the inodilator drug pimobendan. The diuretic forces the kidneys to excrete more sodium and water. This in turn eliminates pulmonary oedema (fluid in the lungs) and so improves your pet's breathing. With right-sided congestive heart failure (fluid in the abdomen or chest cavity), repeated physical removal by your veterinarian is often the best option (generally by using an appropriately sized needle or catheter under sedation).

Dogs with the variant of mitral valve dysplasia discussed above, with a mitral valve that obstructs blood leaving the heart, are often treated with a beta blocker. Beta blockers are drugs designed to slow heart rate, which in turn can reduce (and in some cases eliminate) the obstruction created by the mitral valve. If started early, this can even lead to a reversal of the thickening of the left ventricle.

Can I delay the onset of congestive heart failure in my pet?

Unfortunately, no medical treatment is currently known which delays the onset of CHF in animals with tricuspid valve dysplasia or the typical form of mitral valve dysplasia.

Is there surgery to correct AV Valve Dysplasia?

In human medicine, valve repair or replacement 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 prohibitive for most pet owners. 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 behaviour. However, the most important monitoring tool a pet owner has at their disposal is the sleeping/resting respiratory rate. Please see the separate sleeping respiratory rate form for more details.

Other clinical signs to watch for include:

- laboured breathing
- fainting spells
- abdominal enlargement
- restlessness
- reduced appetite

If you notice any of the above clinical signs please contact your veterinarian immediately.

What is the prognosis for animals with AV Valve Dysplasia?

The prognosis depends on the stage of disease. The prognosis prior to the onset of CHF is highly variable- dogs and cats may remain in this stage for many years prior to the development of CHF (and in fact some animals will never develop heart failure). For animals with mitral valve dysplasia, once CHF has developed, the prognosis is 12 months on average. However, dogs with tricuspid valve dysplasia and right-sided congestive heart failure, have been known to live 2-3 years before euthanasia is elected (owners normally opt for euthanasia due to uncontrollable fluid accumulation in the belly or because fluid drainage is becoming too frequent).

Although medical treatment is palliative only, quality of life for the most part is considered very good (particularly if owners are closely monitoring sleeping respiratory rates).

The prognosis is potentially much better long-term for dogs with the variant of mitral valve dysplasia discussed above. If these animals respond successfully to beta blockers, a long-term 'cure' is sometimes achievable.

Additional Resource:

<http://vetmed.tufts.edu/heartsmart/>

This is a very useful and well-written resource, providing pet owners with a clear and credible source of information about veterinary cardiology.