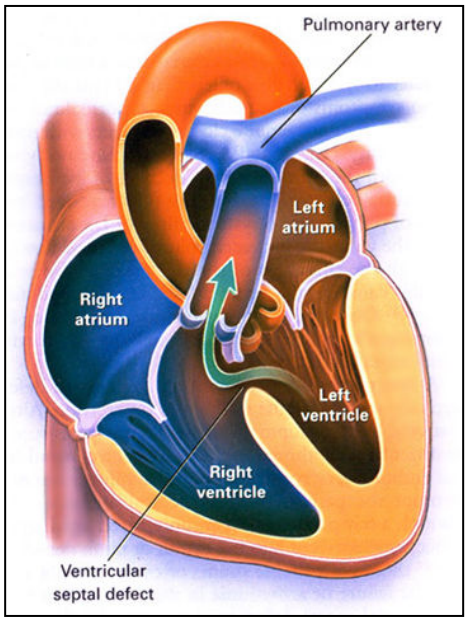
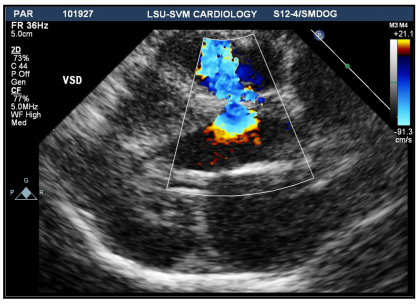
ROCKY MOUNTAIN
VETERINARY CARDIOLOGY, P.C.

VENTRICULAR SEPTAL DEFECT (VSD)





Your pet has been diagnosed with a Ventricular Septal Defect (VSD). A VSD is a malformation of the wall between the two pumping chambers (called "ventricles") allowing an abnormal communication. A VSD is a type of congenital defect, which means it is present from birth.

What is a Ventricular Septal Defect?
In order to understand how this disease may affect your dog, it is important to understand normal circulation in the heart. Blood drains from the body into the right collecting chamber (called "atrium") where it passes through the tricuspid valve and into the right pumping chamber (called "ventricle"). From here, blood is pumped into the pulmonary artery and subsequently to the lungs where it picks up oxygen. The oxygenated blood then drains passively into the left atrium, through the mitral valve, and into the left ventricle. The left ventricle then pumps the blood through the aorta and back to the body.

A VSD is an abnormal communication between the left and right ventricles, which results from incomplete development of the wall between the two chambers called the "interventricular septum." VSDs are classified based upon whether they are restrictive or non-restrictive.

Restrictive VSD: A restrictive VSD is a smaller diameter VSD that provides resistance of blood flow. These are the most common VSDs that we diagnose in dogs and cats. Due to normally higher pressures in the left side of the heart compared to the right side of the heart, most have blood flow from left-to-right through the hole. The amount of blood shunted depends on size of the VSD and the pressure difference across the VSD. Therefore, restrictive VSDs are further classified based on

whether they are “hemodynamically significant” or not. In a hemodynamically significant VSD, the shunted blood moved to the pulmonary arteries (the blood vessels that go to the lungs) to the left side of the heart. The left ventricle remodels and becomes larger because of this increased flow, called “over-circulation”. Ultimately this over-circulation can cause fluid to exude from the pulmonary vasculature. This fluid is called pulmonary edema, which is evidence of congestive heart failure and can make your pet cough and breath harder/with more effort.

Non-restrictive VSD: A *non-restrictive VSD* is a larger diameter defect that allows blood to flow freely between the left and right sides of the heart. The direction of flow is determined by resistance from the lungs and from the body (called “systemic resistance”). Normally systemic resistance is about five times that of the resistance in the lungs, so blood will shunt left-to-right through the large defect. An increase in the resistance in the lungs occurs due increased flow to the lungs due to the large defect. When this occurs, the right ventricle becomes thicker to accommodate the increase in pressure from the lungs, and the left ventricle enlarges to accommodate the increase in blood flow. Rarely, pulmonary hypertension (increased pressure in the lungs) can become so severe that the right ventricular pressure exceeds the left ventricular pressure. This results in shunt reversal, and blood will flow from the right ventricle to the left ventricle. This reversal can cause difficulties because it means that less blood goes to the lungs to pick up oxygen.

Testing

Most VSDs are detected when a puppy or kitten is very young, because the defect is present from birth. Most young animals will have a murmur of variable intensity based on the size of the defect. Heart murmurs are caused by turbulent blood flow through the defect, much like the bubbling sound that occurs when a river flows through a dam. The smaller the VSD opening, the louder the murmur, due to increased turbulence of blood flow. Further evaluation of VSDs requires a heart ultrasound (echocardiogram) to assess the heart structure and function. An echocardiogram enables measurement of all the heart chambers, as well as evaluation of the direction of blood flow. In some cases, chest x-rays will also be recommended to further assess the amount of blood flow to the lungs, as well as to look for evidence of heart failure.

Treatment

Many VSDs are so small that therapy is not indicated. Some VSDs need medical management. Occasionally a VSD is large enough that placement of an occluder device is indicated. These VSDs need to be in a proper location for the occluder to be deployed. There are also some palliative surgeries that can also be considered.