

# Pulmonic Stenosis (“PS”)

Pulmonic stenosis is the third most common congenital heart disease in dogs. It can be accompanied by additional heart defects or it can be mild enough to be no more than a surprising incidental finding. Pulmonic stenosis refers to a constriction of the pulmonic heart valve through which blood must pass on its way from the heart to the lung. In order to understand pulmonic stenosis, it is necessary to understand some normal heart anatomy. The heart sits more or less centrally in the chest and is divided into a left side, which receives oxygen-rich blood from the lung and pumps it to the rest of the body; and a right side, which receives “used” blood from the body and pumps it to the lung to pick up fresh oxygen. Because the left side of the heart must supply blood to the whole body, its muscle is especially thick and strong while the right side, which only pumps to one nearby area, tends to be thinner. When the ventricles pump, the blood from the left shoots through the aortic valve and the blood from the right side shoots through the pulmonic valve. The area where the blood exits the right ventricle is called the right ventricular outflow tract and it consists of the pulmonic valve and the main pulmonary artery.

In pulmonic stenosis, the right ventricular outflow tract is narrowed either at the actual valve, just before it, or just after it. The heart must pump extra hard to get the blood through this unusually narrow, stiff little valve. The right side of the heart becomes thick from all this extra work but in doing so its normal electrical conduction may not be normal. The rhythm of the heart’s filling and pumping cycle can be disturbed as the muscle becomes abnormal. Boxers and Bulldogs tend to show a certain form of pulmonic stenosis: in Boxers and Bulldogs, a coronary artery can wrap around the pulmonary artery exiting the heart and constrict it.

An especially harmful form of pulmonic stenosis is accompanied by what is called tricuspid valve dysplasia. The tricuspid valve is the three-leafed valve that separates the right atrium from the right ventricle. Normally this valve is closed when the ventricle pumps, ensuring that all its blood pumps forward. If this valve is leaky then some of the blood pumps backwards. Another congenital problem that can complicate pulmonic stenosis is called a patent foramen ovale. The foramen ovale is basically a hole in the septum that divides the heart into right and left sides. If the patient has pulmonic stenosis, the pressures in the right side of the heart are so high that blood is pushed from the right atrium into the left atrium with every beat of the heart. This allows unoxygenated blood to mix into the circuit reserved for oxygenated blood. Generally this is merely a mild phenomenon noticed on the echocardiogram.

## What Does this Mean for the Pet?

A mild case is of little concern and usually does not affect life expectancy. Luckily, most cases are mild and do not require treatment; fairly severe disease is needed for clinical signs to appear.

Some dogs will show some or all of the following signs:

- \* Tiring easily
- \* Fainting spells (usually from the abnormal electrical heart rhythm)
- \* Fluid accumulation in the belly
- \* Blue-tinge to the gums especially with exertion
- \* Sudden death (rare!)

Once physical findings suggest heart disease, possibly radiographs and ideally an echocardiogram follow. After the diagnosis of pulmonic stenosis is made, the next most important issue is to grade its severity. This is done with a type of ultrasound called Continuous Wave Doppler which measures a pressure gradient across the pulmonic valve. A pressure gradient of less than 40 mm of Hg generally requires no treatment at all. A gradient greater than 80 mm of Hg means a significant risk of sudden death and therapy should be pursued (generally balloon valvuloplasty). Dogs with gradients between 40 and 80 are not as predictable regarding benefit of valvuloplasty.

## Treatment: Balloon Valvuloplasty

Severe pulmonic stenosis cases can be treated by inserting a special balloon into the pulmonic valve where it is inflated, breaking down the obstruction. Performing this procedure reduces the risk of sudden death by 53% and improves quality of life. Certain types of valve deformity will prevent this treatment and dogs that have a coronary artery wrapped around the pulmonary artery can’t have this treatment, either.

## Treatment: Surgery

Dogs for whom the stenosis is just before the valve rather than at the valve itself may benefit from surgery. There are several techniques that can be used to widen the pulmonary valve or to by-pass it. These procedures require a very experienced surgeon and bear significant risk.

## Treatment: Medication

Unfortunately, medication is not very helpful for pulmonic stenosis except to manage any right-sided heart failure. In some cases, medications called beta blockers can be used in an attempt to relax the muscles of the heart and dilate the stenosis. This will not relieve the constriction but could palliate it.

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