

## Balloon Valvuloplasty for Pulmonic Stenosis

### Normal Heart Function – An Overview

Dog and cat cardiology bears a striking similarity to human cardiology; they all have hearts that are divided into four chambers. The two top chambers are referred to as the right atrium (RA) and left atrium (LA). These are thin-walled structures that serve to hold the blood as it returns from the body (RA) and lungs (LA). The bottom chambers of the heart are the ventricles; these are the muscular pumping chambers of the heart. The right ventricle (RV) pumps blood to the lungs, whereas the left ventricle (LV) pumps blood to the body. The right and left sides of the heart are separated by a septum. The atria and the ventricles are separated by valves that open and close to ensure blood can only flow in one direction. The mitral valve is on the left side of the heart and the tricuspid valve is on the right side of the heart.

There are also valves that separate the heart from the major blood vessels that act as conduits to move blood through the body. The pulmonary valve separates the right ventricle from the pulmonary artery, which carries blood to the lungs. The aortic valve separates the left ventricle from the aorta, which carries blood to the body. The movement of blood throughout the heart occurs due to contraction of the chambers, which results from electrical impulses that are conducted through the heart walls. In normal heart conduction, an electrical impulse starts at the top of the heart (sinoatrial node or SA node), causing the atria to contract. The impulse is then conducted through the atrioventricular (AV) node to the ventricles, causing them to contract, pushing the blood around the body.

### Pulmonic Stenosis

Pulmonic stenosis (PS) is a congenital defect of the pulmonary valve that results in improper opening of the valve (Figure B). Since the same amount of blood must pass through a smaller opening, the right side of the heart has an increased workload. Over time, the pressures on the right side of the heart increase dramatically and the heart muscles on that side hypertrophy (thicken) to compensate. If left untreated, patients can go into right-sided heart failure.

The treatment for this condition is balloon valvuloplasty. This procedure requires a small incision in the neck or on the inside of the back leg. Through the incision, a catheter is inserted into the blood vessels and is guided into the right side of the heart to reach the pulmonary valve.

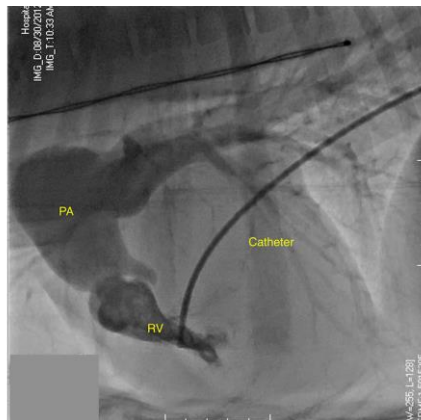


Figure A

Fluoroscopy (live x-ray) is used to perform an angiogram to evaluate the anatomy (Figure A), and then a balloon dilation catheter is guided across the valve (Figure B). Once the balloon is in position at the level of the pulmonic valve, it is inflated and then removed. The goal is to use the balloon to open the valve so that it is able to open more freely and allow blood to flow into the lungs more easily.



Figure B

This procedure is successful in the majority of cases (success rates reported ~ 85%), however, there are a small percentage of cases that have a recurrence of stenosis (narrowing of the valve) as the body attempts to heal the valve after surgery. For this reason, it is important to continue to monitor your pet with recheck echocardiograms following a balloon valvuloplasty procedure.

Unfortunately, some dogs have an abnormal blood vessel (coronary artery) that wraps around the pulmonary artery and significantly increases the risk of complications during the procedure. The problem in cases with an abnormal coronary artery is that these blood vessels supply nutrients to the heart muscle, and if it is occluded or ruptured by the balloon valvuloplasty procedure, the procedure can be fatal. We carefully screen our patients initially with echocardiography (ultrasound of the heart) and in more challenging cases, we may perform a CT scan and/or angiogram. An angiogram involves injecting a contrast agent into the coronary blood vessels to look at the anatomy. If an abnormal coronary artery is confirmed. There is the option to attempt medical management or consider a "conservative" balloon valvuloplasty, using a smaller balloon.