

Patent Ductus Arteriosus Occlusion

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 (Figure A). 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 through 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.

Patent Ductus Arteriosus

The ductus arteriosus is a fetal vessel that connects the main pulmonary artery and aorta. Normally, it closes shortly after birth. Patent Ductus Arteriosus (PDA) is when this extra blood vessel does not close properly. PDA is one of the most common congenital heart defects in dogs. PDA causes a volume overload to the left side of the heart (left atrium and left ventricle) as well as the blood vessels in the lungs. Over time, the left side of the heart may not be able to compensate for the extra blood flow and signs of left-sided congestive heart failure can result, including lethargy, weakness, decreased activity level, coughing, difficulty breathing or potentially collapse episodes. An additional concern is that the blood pressure in the lungs can increase over time (called “pulmonary hypertension”). When there is significant pulmonary hypertension, the blood flow through the PDA can reverse, resulting in a serious problem. Most PDAs cannot be corrected once the blood flow is “reversed”. This is a very serious problem and most PDAs cannot be corrected once they are “reversed”.

The treatment for PDA is occlusion (closure) of the extra blood vessel. This can be done surgically in the chest by direct ligation (tying off) of the PDA, or in many cases, a minimally invasive technique can be used to place an expandable device inside the PDA through the use of fluoroscopy.

Amplatz Canine Duct Occluders (ACDOs) were developed specifically for the purpose of minimally invasive PDA occlusion in dogs. A small incision is made on the inside of the leg over the femoral artery. A catheter is then placed inside the femoral artery and it is directed by fluoroscopy through the blood vessels and into the PDA. Once the correct positioning is confirmed by angiography (contrast injection into the blood vessel – Figure C), the ACDO device is deployed into the PDA to completely occlude blood flow through this extra blood vessel (Figure D).

Potential complications of this procedure include bleeding, infection, residual flow through the PDA and embolization of the device, however, all of these are very uncommon. Success rates of this procedure are reported to be 97%, and due to the minimally invasive nature, these patients typically recovery very quickly and can be discharged the day after the procedure. When this congenital defect is detected and promptly corrected, patients can live a completely normal life.

Figure C



Figure D

