



## **Understanding Patent Ductus Arteriosus**

### **How does the heart work?**

The heart is responsible for maintaining the circulation of blood around the body. This organ is divided into four chambers, comprised of the right and left atria (upper collecting chambers) and ventricles (lower pumping chambers). The right side pumps deoxygenated blood, returning from the body via the veins, into the lungs. From the lungs, oxygenated blood enters the left side of the heart where it is pumped out to the tissues of the body through the arteries.

### **What is patent ductus arteriosus?**

The ductus arteriosus is a short blood vessel that provides a communication between the aorta (which carries oxygenated blood from the heart to the body) and the pulmonary artery (which carries deoxygenated blood to the lungs). Before birth, this connection allows blood to bypass the lungs as the fetus' blood is oxygenated by the placenta. Normally, the ductus arteriosus closes within 3 to 4 days after birth. A patent ductus arteriosus (PDA) results when the duct fails to close or closes incompletely.

PDA is the most common congenital cardiac malformation in dogs, though it is quite uncommon in cats. Small breeds such as Miniature poodles, Maltese, Bichon frises, and others are predisposed to this condition. Females are also more commonly affected than males. PDA is inherited in Miniature and Toy poodles.

### **How is a PDA detected?**

PDAs can be detected as early as a week of age by using a stethoscope to listen to the heart. A “machinery” like murmur is heard continuously as the heart contracts and relaxes. This is loudest over the left base of the heart and is heard

best with the stethoscope in the patient's arm pit. Because blood runs out of the aorta into the pulmonary artery between heart beats, the patient's diastolic blood pressure will be somewhat lower than usual. This makes their pulses feel "bounding" (very strong and forceful). Patients often appear otherwise completely normal and healthy.

### **Are there surgical options for PDA?**

There are three methods for surgical repair. Each have advantages and disadvantages.

The first is a complete ligation (tying-off) of the duct. The PDA is accessed via an incision into the chest (thoracotomy), followed by direct visualization and ligation. Post-operative complications are not common, but can occur. About 3% of dogs will have residual blood flow through the PDA after ligation, requiring surgery to be repeated.

The second is placement of a coil in the ductus via a catheter in the femoral artery of one of the hindlimbs. These coils are made of wire coated with strands of dacron which promote blood clot formation (thrombosis) within the duct, blocking further blood flow. The third is placement of an Amplatzer Canine Ductal Occluder (ACDO) in the ductus via a catheter in the femoral artery. These devices are made of a Nitinol wire mesh and contain polyester fabric which promotes thrombosis to prevent blood flow through the ductus in a similar way to a coil. However, the shape of the ACDO is designed to fit securely in the mouth of the ductus and be less likely to become dislodged than a coil. Though these procedures are much less invasive than direct ligation, which requires a thoracotomy, they are difficult to perform in very small animals. Additionally, the shape of the ductus is occasionally not amenable to these procedures. In some cases, surgery may be delayed until the patient grows to an adequate size. Your veterinarian will discuss the options with you that best suit your pet's needs and will be happy to answer any questions that you might have.

### **What is the long term prognosis for PDA?**

Uncorrected, the prognosis for most patients with PDA is poor. Without correction, left-sided congestive heart failure usually develops, in which the heart is no longer able to pump blood forwards effectively, causing blood to back up. As a result fluid collects in the lungs, leading to difficulty breathing. Life expectancy following the development of congestive heart failure is variable, but is typically around 6-9 months. Only a small proportion of dogs have a PDA small enough that congestive heart failure does not eventually occur.

Fortunately, there are excellent surgical options available. Of all the congenital malformations in companion animals, PDA is the one most amenable to complete repair. With surgical correction, the prognosis is somewhat variable, depending on how advanced the changes in the heart are at the time of diagnosis. However, many animals have a normal life expectancy following surgery.

Thank you for visiting the cardiology service at the Ryan Veterinary Hospital. If you have any further questions, please do not hesitate to contact us.