PDA in Pets – There's Nothing Affectionate About Patent Ductus Arteriosus

People are frequently born with heart defects. They often require intricate and specialized surgeries to help correct them. So too can dogs and cats be affected by congenital heart abnormalities, the most common of which is called patent ductus arteriosus or PDA. This week I share some important information about this serious condition. I hope you find this information helpful. Happy reading!

PDA – What is it?

Did you know every dog, cat, and human is born with a ductus arteriosus (DA)? That's right! A DA is a normal and necessary blood vessel in utero. Proper fetal development depends on circulation through the umbilical system for oxygen because the lungs are fully developed. The fetal heart still pumps blood, but the blood can bypass the underdeveloped lungs through the DA. The DA is an artery

that connects the pulmonary artery and the aorta. The pulmonary artery carries blood to the lungs, while the aorta carries blood to the body for use. Fetal lungs contain a lot of water so there is a high resistance to blood flow through them. So, blood preferentially flow through the DA because it's a low-pressure system.

When dogs & cats take their first breath or air, everything changes! Lungs fill with oxygen, greatly lowering the resistance to blood flow. This means blood now preferentially flows through the lungs instead of through the DA. As such the DA closes within one week of life (and often within the first 72 hours). When the DA doesn't close properly, we use the term patent ductus arteriosus or PDA.

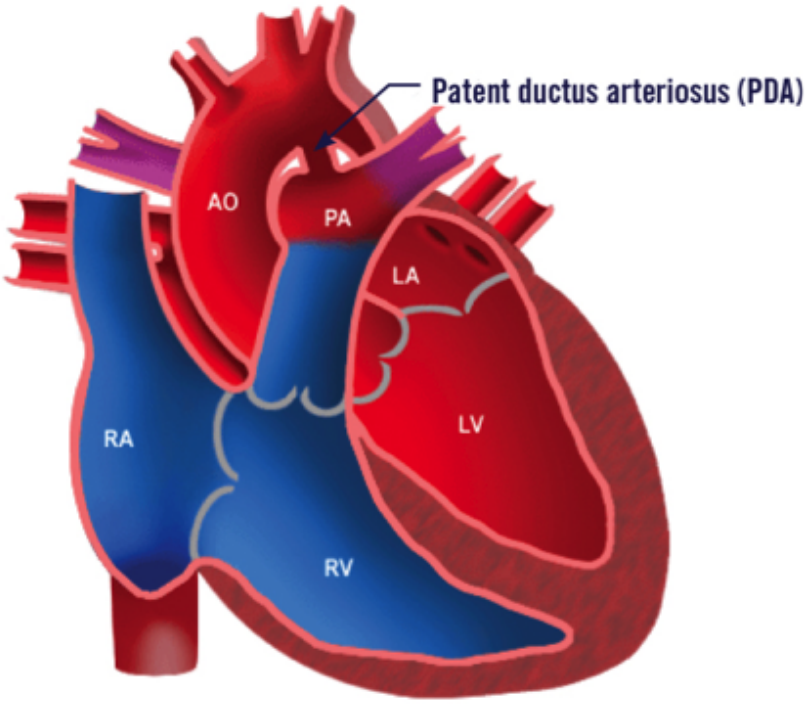

Illustration showing a patent ductus arteriosus (PDA). Image courtesy of board-certified veterinary cardiologist Dr. B Tyrell

Why is a PDA a big deal? Blood from the aorta on the left side of the heart now flows through the PDA into the pulmonary artery on the right side of the heart. This is the opposite of the direction blood flowed during fetal development, and is often referred to as a left-to-right shunt. This blood flow is bad for the body because a substantial volume of blood is inappropriately recirculated to the lungs rather than to the body. Since the body's oxygen requirement isn't decreased, the

heart must work harder to deliver oxygen-rich blood to the body.

PDA – What does it look like?

Some breeds of dogs are over-represented for having PDAs, including:

- Shetland sheepdogs
- Miniature poodles
- Cocker spaniels
- Collies
- German shepherds
- Keeshonds
- Pomeranians

Some dogs and cats do not have any clinical signs associated with a PDA. These patients simply have a characteristic murmur heard during a physical examination. Other patients develop respiratory distress because their hearts are working too hard and begin to fail.

PDA – How is it diagnosed?

During a complete physical examination, a veterinarian uses a stethoscope to carefully listen to heart and lung sounds. Normally, the heartbeat has two sounds – lub dub. A murmur is a swishing sound heard when there is turbulent blood flow across a heart valve or through an abnormal conduit like a PDA. Dogs and cats with PDAs have a characteristic murmur that sounds like a washing machine. It is often called a continuous or machinery murmur, and it can be heard best when the stethoscope is placed near the left axillary region (arm pit). A veterinarian will also recommend evaluating chest radiographs (x-rays) to look for evidence of heart failure, as well as characteristic changes to the aorta and left side of the heart. An electrocardiogram (ECG, EKG) should be evaluated to ensure the electrical activity of the heart is normal. Ultimately, an ultrasound examination of the heart called echocardiography is needed to confirm a clinical suspicion of a PDA.

A board-certified veterinary cardiologist performs transesophageal echocardiography. Photo courtesy of Cornell University's College of Veterinary Medicine.

Occasionally, a special type of echocardiogram called transesophageal echocardiography is recommended. This imaging procedure is performed while a patient is anesthetized. A flexible camera is introduced through the mouth into the esophagus to view the heart through the wall fo the esophagus. Echocardiography is a specialized imaging technique that requires extensive training and experience, and is best performed by board-certified veterinary cardiologists.

PDA – How is it treated?

Surgery is needed to correct PDAs, and should be performed as soon as possible because ~66% of patients die before one year age without treatment. There are two procedures that may be performed:

- Surgical ligation
- Coil embolization / Vascular plug

Surgical ligation is the traditional surgery to repair PDAs in dogs and cats. Indeed, it is the preferred method of treatment in cats. The chest cavity is opened, and suture is used to tie off the PDA. As this surgery is intricate and understandably requires extensive knowledge and expertise, pet parents will likely find it invaluable to partner with a board-certified veterinary cardiologist or surgeon. The complication rate of surgical ligation is less than 5%, and less than 2% require a second procedure.

Coil embolization is a very specialized technique that involves introducing a unique steel or Dacron coil through an artery in the neck or hind leg. The coil is advanced using a special type of imaging called fluoroscopy, essentially a type of live-action radiography. The coil is ultimately deployed inside the PDA. Small clots gradually form on the coil, and ultimately occlude the PDA. Watch the video below to see the deployment of a coil in a PDA.

A vascular plug is different than a coil, but the goal is the same: placement of a device in the PDA to induce closure of the PDA. These techniques are not appropriate for very large PDA and for those patients weighing less than five pounds (2.2 kg). Coil embolization has a documented 2.4% mortality rate.

The take-away message about PDA in dogs…

Patent ductus arteriorus is a congenital condition in dogs and cats characterized by failure of a fetal blood vessel called the ductus arteriosus to close after birth. Failure of DA closure results in abnormal blood flow that causes the heart to work too much and can lead to heart failure. With early recognition and surgery, patients can lead happy and high quality lives.

To find a board-certified veterinary cardiologist, please visit the American College of Veterinary Internal Medicine.

To find a board-certified veterinary surgeon, please visit the American College of Veterinary Surgeons.

Wishing you wet-nosed kisses,

CriticalCareDVM