

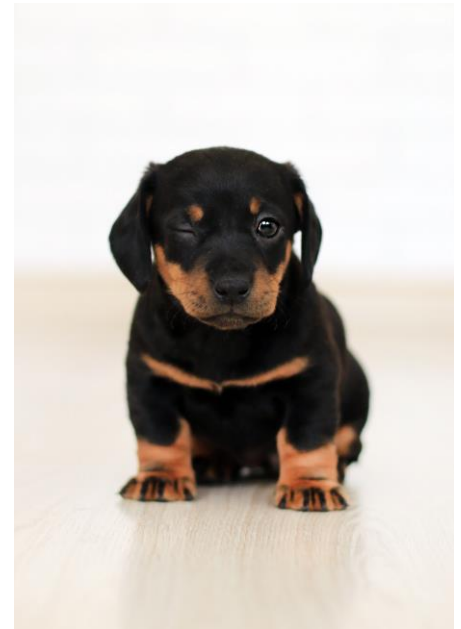


EAST COAST VETERINARY CARDIOLOGY

Patent Ductus Arteriosus (PDA)

Patent Ductus Arteriosus (PDA) is one of the most common congenital cardiac disorders diagnosed in the dog. It is rare in cats. It is especially common in female Shepherd dogs, as well as other breeds (Poodles, Jack Russell Terriers, Collies). It is characterized by persistence of the ductus arteriosus (DA) which is the fetal communication which exists between the aorta and the main pulmonary artery. In the fetus, it serves to divert blood away from the non-oxygenated and non-functioning lungs (via the pulmonary artery) to the systemic circulation (aorta). This blood then returns to the mother to be filtered and re-oxygenated before returning to the fetus.

In a normal individual, the DA closes at or shortly after birth. In some individuals, the DA can remain open (hence "patent") and serves as a communication between the aorta and the pulmonary artery. Due to the higher pressures in the aorta after birth, oxygenated blood will shunt across the DA into the pulmonary artery. This recirculation "circuit" then causes enlargement of the left atrium and pulmonary veins, left ventricle and pulmonary artery. This enlargement places affected animals at risk for left sided congestive heart failure (CHF), with many affected dogs with a large PDA experiencing CHF prior to the age of one. Dogs with CHF related to a PDA can survive a brief period with medical management, typically about one year.



Due to the continuous blood flow through the DA, animals with a PDA will have a classic type of heart murmur known as a continuous heart murmur. If a continuous heart murmur is noted in a young dog or cat, referral to a veterinary cardiologist is recommended to confirm the presence of a PDA (and rule out other congenital cardiac defects which may be associated with a continuous heart murmur) and assess the degree of heart enlargement and risk for CHF.

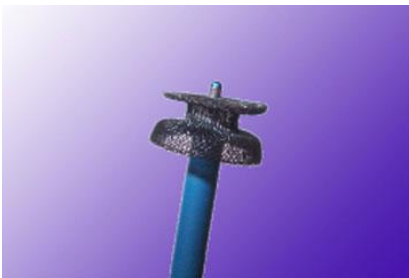
In some patients with a PDA who are left untreated, due to the increased blood volume flowing through the pulmonary vasculature, pulmonary hypertension can develop. Pulmonary hypertension refers to higher blood pressure in the pulmonary vasculature. Due to this higher than normal pressure in the pulmonary artery, the blood shunting through the PDA will start shunting in the opposite direction (i.e.: right to left from the pulmonary artery to the aorta). This means there is mixing of blood that has low levels of oxygen with the systemic blood, which should have high levels of oxygen. This leads to hypoxemia (less oxygen in the blood) and therefore hypoxia (less oxygen

reaching the tissues). When a PDA reverses to shunt right to left, clinical signs of exercise intolerance and cyanosis are often noted. PDAs that reverse are considered uncommon.

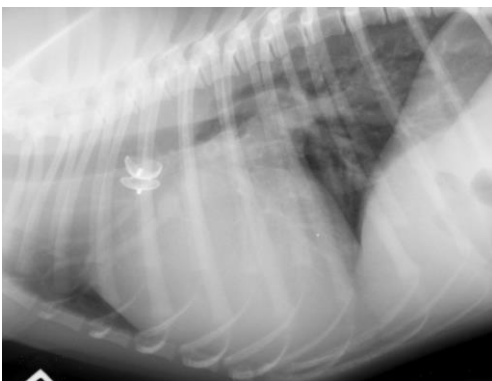
Treatment of choice is closure of the ductus, typically either via trans-arterial placement of an occluder ('plug') or coil. This procedure involves placing a catheter into the femoral artery to feed the occluder along a guidewire through the aorta to the DA. This catheter is guided using both fluoroscopy (real time x-ray) and echocardiography. Once the occluder is in place, the guidewire is removed and the device remains in place to obstruct further blood flow through the DA. This procedure is considered minimally invasive with excellent outcomes.

In some individuals, direct surgical ligation of the ductus is required - this is typically in individuals too small for trans-arterial closure or for those with an abnormally shaped DA that will not accommodate the occluder. Generally, a tapered DA is required for occluder positioning. Regardless of which procedure is pursued, once the ductus is closed with resolution of the left to right shunting, patients are effectively cured and typically have a normal length and quality of life.

In cats, they are typically too small to consider trans-arterial closure of the PDA. They are generally best managed with direct surgical ligation. These types of procedures are generally offered at specialty and veterinary teaching hospitals given the complexity of the procedure and the specialized equipment which is required.



The canine ductal occluder which has been designed for closure of PDAs in dogs. It is delivered via a trans-arterial approach to the ductus arteriosus to obstruct blood flow.



Thoracic radiograph of a dog who had a ductal occluder placed. The heart is enlarged and this patient had CHF prior to placement of the ductal occluder. Following closure of the PDA, this patient was able to stop CHF therapy and over time, the heart reduced in size.

Key Points

PDAs are one of the more common types of congenital cardiac defects in the dog. They occasionally are diagnosed in cats.

PDAs allow for continuous blood flow from the aorta into the pulmonary artery. This creates a recirculation circuit that leads to enlargement of the left sided heart chambers.

Patients with an uncorrected PDA are at risk for development of left sided CHF. Once in CHF, patients, generally live about 1 year.

Surgery to close the ductus arteriosus can be achieved by two methods: placing an occluder (plug) via a trans-arterial minimally invasive approach; or, direct surgical ligation of the PDA (via thoracotomy).

Prognosis with successful closure of the PDA is generally excellent.

In rare cases, a PDA can reverse leading to deoxygenated blood flowing from the pulmonary artery into the aorta causing hypoxia. This occurs due to pulmonary hypertension.

In cats, PDAs are best managed via surgical ligation given their smaller size.

