

Patent ductus arteriosus

Patent ductus arteriosus (PDA) is a congenital heart disease. This disease is characterized by failure of a fetal blood vessel, known as the ductus arteriosus (DA), to close at birth. In the fetus, the ductus arteriosus bridges the aorta and the main pulmonary artery (two major blood vessels) and allows blood to bypass the lungs in utero. For normal healthy animals, the ductus arteriosus closes off at birth. Closure of the DA keeps systemic and pulmonary (lung) blood flow separated.

For individuals with a typical patent ductus arteriosus, blood continuously flows from the higher pressure aorta to the lower pressure pulmonary artery. This shunted blood flows through the lungs and back to the left side of the heart. The net effect is overcirculation of the lungs and a disproportionate flow of blood through the left side of the heart compared to the right side of the heart. This abnormal distribution of blood raises pressure on the left side of the heart and increase the risk for congestive heart failure. Increased blood flow through the lungs can also damage the blood vessels in the lungs, leading to abnormal resistance to blood flow through the lungs (pulmonary hypertension). This in turn can cause the pressure in the right heart to become abnormally elevated, and in some cases this can cause the shunt to change direction and become bidirectional or “right-to-left”.

A typical PDA has continuous blood flow from the aorta to the pulmonary artery (also known as a “left-to-right” shunting PDA). This defect has a very characteristic heart murmur (continuous, “washing machine”) heard with a stethoscope. Left untreated, most patients with patent ductus arteriosus will develop congestive heart failure at a very young age. Less commonly, a left-to-right shunting PDA can change to a right-to-left shunting PDA, which limits options for treatment. An early study of dogs with uncorrected PDA showed 64% mortality in the first year of life.

Treatment:

Left-to-right shunting PDA is treated by occluding the ductus arteriosus vessel. Occlusion may be performed by a minimally invasive procedure or with an open-chest surgical approach. A minimally invasive procedure utilizes a catheter placed into an artery in the leg through which a medical device is introduced and advanced to the level of the PDA where it is deployed to stop blood flow. With a traditional surgical approach, the chest is opened and the ductus arteriosus vessel is identified and ligated from outside the heart. Both types of procedures are equally successful. Overall patient size and the size and shape of the ductus arteriosus usually determine which procedure is recommended.

Right-to-left shunting or bidirectional PDA is not easily corrected by occlusion or surgical ligation because of the elevated pressures in the lungs. Some of these patients can be treated with drugs to decrease right heart and pulmonary artery pressure and if successful they may be candidates for surgical PDA occlusion. These patients are also prone to excessive red blood cell production and may require periodic phlebotomy.