

## **CONGENITAL HEART DISEASES: HOW TO RECOGNIZE THEM?**

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The veterinarian should be familiar with common cardiac malformations, its associated clinical signs, the repercussions for breeding and the possibilities of curative or palliative treatment.

Despite many American papers and textbooks stating that Patent Ductus Arteriosus (PDA) is the most common canine CHD, in Europe it appears that aortic stenosis (AS) is more prevalent. Pulmonic stenosis (PS) is the third most common congenital heart disease (CHD) in dogs. In cats mitral and tricuspid dysplasia are the most common CHD, followed by ventricular septal defects. However, cats have often multiple congenital defects.

### Aortic stenosis

Aortic stenosis commonly affects breeds like Boxers, Golden Retrievers, Rottweilers, German shepherds and Newfoundland dogs (in USA). It can be valvular, supra-valvular and sub-valvular. The latter is the more common form. The associated murmur is a systolic crescendo-decrescendo murmur, heard best at the left heart base and the right cranial thorax, and its grading is in linear relationship with disease severity. Mild obstructions cause soft murmurs that are difficult to distinguish from innocent or functional murmurs. In dogs with severe obstruction the arterial pulse might be hypokinetic with a tardy or delayed peak. The severity of aortic stenosis depends on the pressure gradient across the stenotic area (mild < 40 mm Hg, moderate 40-80 mm Hg and severe > 80 mm Hg).

### Patent Ductus Arteriosus

Many pure breeds and also mongrels have been represented in the different epidemiological PDA studies published. The clinical hallmark of a left-to-right shunting PDA is a continuous murmur, with a point of maximum intensity at the left base of the heart. The murmur can be very localised. The murmur is formed by a pressure gradient, existing in both systole and diastole, between the aorta and the pulmonary artery and blood flowing through the ductus during both periods. Most PDA murmurs are loud, and therefore have an associated precordial thrill. A

continuous murmur is fairly pathognomonic for left to right shunting PDA, however some other less common conditions should be considered. Mitral valvular incompetence is a frequent finding in PDA cases. Another important clinical finding with PDA is increased femoral artery pulse pressure (water hammer pulse). With severe pulmonary hypertension (right-to-left shunting) the murmur will disappear and differential cyanosis might be present (pink oral mucous membranes and blue vulva or penis).

### Pulmonic stenosis

Pulmonic stenosis is common in certain breeds including the Beagle, Samoyed, Chihuahua, English bulldog, Miniature schnauzer, Labrador retriever, Mastiff, Chow-chow, Newfoundland, Basset hound, terrier and Spaniel breeds. It can be valvular, sub-valvular and supra-valvular. In Bull breeds it has been associated with aberrant coronary arteries. Valvular PS is the most common form in veterinary medicine. This form can be subdivided in a Type A (normal pulmonary artery diameter with parachute-like valve) and Type B (annular hypoplasia and a dysplastic valve). A high frequency systolic ejection murmur, best heard over the left heart base is characteristic. The murmur is crescendo-decrescendo, holosystolic with maximum intensity in mid-systole. It does not tend to radiate as widely as the murmur of aortic stenosis. In severe PS the pulses can be slightly weak. The severity depends on the pressure gradient across the valve (mild <50 mm Hg, moderate 50-100, severe >100 mm Hg), and there is, in most cases, a linear relationship between murmur grading and severity. Post-stenotic dilatation is not related to the severity of the stenosis.

### Atrioventricular dysplasia

Mitral dysplasia is most commonly reported in cats and in large dogs like Great Danes, German Shepherds and Rottweilers. In the UK the Bull Terriers are commonly affected. It represents a complex of thickened valve leaflets, abnormally short or long chordae tendineae, abnormal papillary muscles and abnormally low implanted mitral valve. The murmur of mitral insufficiency is typically of mixed frequency and harsh sounding, but it may be high-pitched or musical in quality. Although this murmur is usually loudest over the mitral valve area and left atrium, it commonly radiates dorsally and to the right thorax, confounding reliable identification of tricuspid regurgitation. Intensity does not reliably indicate severity, especially when murmurs are musical. Care should be taken in broad-chested dogs (like English Bull terrier) were because of

the conformity of the chest, important murmurs might not be audible. Doppler-flow echocardiography to exclude mitral valve dysplasia is strongly recommended if these dogs will be used for breeding. Mitral stenosis (MS) is a severe form of mitral dysplasia and is most commonly seen in Bull Terriers. With mitral stenosis, occasionally a mid-diastolic murmur can be heard in the left apical area, but more commonly a murmur of mitral insufficiency will be detected.

Tricuspid valve dysplasia is not just one type of lesion. Lesions include thickened valve leaflets, abnormally short or long chordae tendineae, abnormal papillary muscles, abnormally low implanted tricuspid valves (Ebstein anomaly). There is a preponderance in male Labradors but OESD, Great Danes, GSD and Irish setters have also been reported. The intensity and duration of the systolic plateau murmur of tricuspid insufficiency tend to vary with respiration. Supraventricular tachycardias have been associated with tricuspid dysplasia in Labradors. Electrocardiographically splintered QRS complexes are also commonly found in dogs with tricuspid valve dysplasia.

### Ventricular septal defects

Most ventricular septal defects (VSD) are high and peri-membraneous. VSD's are classified restrictive and non-restrictive depending on the pressure gradient across the two ventricles ( $> 4\text{m/s}$  restrictive). The murmur caused by a restrictive VSD is loud, harsh and typically best heard on the right cranial thorax. The shape and quality of these murmurs vary tremendously, but they are often associated with a thrill. Murmur intensity and duration may be reduced if the VSD is large and pulmonary hypertension develops (so there is an inverse relationship between murmur grade and severity). With severe pulmonary hypertension (right to left shunting) the murmur is absent and the second heart sound is split.

### Atrial septal defects

Atrial septal defects (ASD) are most commonly seen as an incidental finding in Boxers, Samoyed and Dobermann. Depending on their embryological origin they are classified as ostium primum, ostium secundum, ostium sinus venosum, ostium coronary sinusum and patent foramen ovale defects. Auscultatory findings with ASD include a systolic ejection murmur loudest over the pulmonic area, due to right ventricular volume overload, occurring in combination with fixed splitting of the second heart sound.

## Tetralogy of Fallot

Tetralogy of Fallot (TOF) is a combination of a VSD, pulmonic stenosis, dextraposition of the aorta and secondary right ventricular hypertrophy. It is the most common cyanotic congenital defect in the dog. Cyanosis varies from absent to severe. A cardiac murmur is commonly but not always present. The murmur is most commonly due to pulmonic stenosis and is usually loudest at the left heart base. Because the VSD is often large and there is polycythaemia (increased blood viscosity) it does not create a murmur. Femoral artery pressure is normally normal.

## Take home message

A thorough clinical examination with detailed characterisation (point of maximum intensity, timing) of the heart murmur will lead in many cases to an accurate diagnosis of the more common congenital heart diseases. However, to determine the severity, prognosis and need for medical or interventional treatment a Doppler echocardiographical study performed by a trained specialist remains essential.

A list of breed predispositions and heritability is available on [www.acapulco-vet.be](http://www.acapulco-vet.be)