

MURMURS IN PUPPIES - WHAT DO I DO?



Doireann Mullany MVB Cert AVP, Rotating Intern in Small Animal Medicine in University College Dublin, looks at the basics of puppy murmurs and the different types, as well as highlighting the need for awareness of innocent murmurs and congenital cardiac diseases in general practice

The very first consult for a puppy is one of the most joyful yet important consults vets will do. The vet's responsibility and duty is to ensure that there are no congenital abnormalities and the puppy is healthy overall. If there are no issues with clinical examination everyone is happy, both vet and client, but if something like a murmur is found, it is the vet's responsibility to inform the owner and to know the next steps. The prevalence of cardiac defects ranges from 0.13 to 1.6 per cent. Therefore, although rare, it is important to know what to do when one is heard¹. Clients can often immediately think of contacting the breeder and it is the vet's responsibility to keep the owner calm and not to allow them to worry disproportionately. This article is intended as a guide that will, I hope, help this process and allow vets to be prepared for puppy consults regardless of whatever they encounter on clinical examination.

Presentation and clinical examination

Puppies usually enter the consult room being very bright and puppy-like in their behaviour. Mostly, there are no obvious signs of cardiac disease in puppies based only on observing them. A full thorough clinical examination of the puppy is required in any case. However, certain conditions can be seen with observation of the animal alone before clinical examination, including: muscular atrophy, growth retardation, cachexia, and ascites, all of which are signs of cardiac disease.

Mucous membrane colour is important to check if there is a perfusion/circulatory issue which could be cardiogenic. Respiratory rate (although usually not accurate in a consult room due to excitement/nervousness) is also measured

to assess if there is a cardiac issue, e.g., tachypnoea, paradoxical breathing, dyspnoea, etc.

Cardiac auscultation is important to evaluate the heart rate, rhythm, and any abnormal sounds. This should be done in a quiet room and the puppy in a standing position.

To begin with, place the palm of your hand up against the precordium, ideally on ribs 3-5 under the elbow. This is important to detect any precordial thrills/arrhythmias and to know where best to place your stethoscope initially. One must listen to all appropriate areas respectively to not miss any subtle cardiac abnormalities.

Regular strong and synchronous pulses will show appropriate cardiac output; however, this does not completely rule out cardiac disease. Bounding pulses can indicate conditions such as Patent Ductus Arteriosus (PDA). Weak or thready pulses can indicate poor cardiac output, such as an aortic abnormality.

Murmurs

Murmurs are due to turbulence being produced in the heart. This can be due to abnormal communications in the heart itself, abnormalities in valve structure, or differences in blood velocity and viscosity.

Systolic vs diastolic

Systolic murmurs occur during systole (S1-S2) and suggest mitral or tricuspid insufficiencies and ventricular septal defects. Diastolic murmurs (rare) occur during diastole (S2-S1) and may suggest pulmonary or aortic abnormality. Continuous murmurs are associated with an arteriovenous connection usually such as PDA.

Innocent murmurs

On average, an innocent murmur is found in 28 per cent of puppies under the age of six months. Interestingly, in athletic breeds such as sighthounds, 58 per cent of puppies of these breeds have an innocent murmur before six months of age. Innocent murmurs are always lower than a grade 3, usually they are a grade 1 or 2. It can be difficult to distinguish between a murmur linked with congenital heart disease versus an innocent murmur. An innocent murmur is heard on the left hand side, over the aortic valve usually. This is due to turbulence over the aortic valve². They are always systolic type murmurs. The median age of resolution of these murmurs is usually 12 weeks of age, although some can be heard to roughly six months of age. The reason for the resolution of these innocent murmurs is most likely due to the rising haematocrit as the puppy is growing and maturing³. Another method to differentiate if murmurs are innocent or not, is if the murmur is longer than 80 per cent of the systole. If so, no matter the grade, it is usually congenital. Any low grade cardiac murmurs shorter than this are usually innocent⁴. The only method to truly rule out if a murmur is innocent or not is to carry out an echocardiogram. It is not unreasonable in the initial consultation if a low grade (1-2) soft murmur was detected with no clinical signs to wait until the second or third vaccination to re-auscultate. If still present at 12 weeks of age with no clinical signs and still a low grade murmur (1-2), a re-check would be necessary at six months to confirm the murmur has gone. If the murmur has increased intensity or the location is different or it has become a diastolic murmur at the 12-weeks-of-age check, an echocardiogram is necessary at that stage.

If you hear a murmur greater than a grade 3, this would be grounds for concern. A murmur in a certain location does not directly link to a certain congenital abnormality, but it will allow you to educate the owner on the next advisory steps. Table 2 provides a list of the most common congenital cardiac anomalies which you may hear in the first puppy consultation. If you strongly suspect a congenital cardiac condition, the next step is the explanation to the client. Pulmonic stenosis is the most common congenital abnormality and it is due to a narrowing of the pulmonary artery. It is usually narrowed at the level of the pulmonic valves. This narrowing causes blood to flow faster through this area due its obstructive nature which is what we can auscultate. It can be categorised as mild, moderate, or severe. After investigations, if warranted, surgery (balloon valvuloplasty) can be carried out. Otherwise, if the case is severe enough, certain medications (beta-blockers) are an option to prolong the duration of time it takes to acquire right-sided heart failure.

Aortic stenosis is due to a narrowing of the aorta. The narrowing can be at the level of the aortic valve or above or below the valve also. Again, this narrowing causes an increase in the blood's velocity which, in turn, allows a heart murmur to be auscultated. It is important to listen to the thoracic inlet for a murmur as this would be a further indication of aortic stenosis, due to the direction of blood flow. Again, aortic stenosis is categorised as mild, moderate, and severe after echocardiograms. In severe cases, surgery such as a balloon valvuloplasty can be performed in Ireland and/or medication provided to reduce the onset of left sided heart failure and pulmonary oedema.

Grade 1	Soft, murmur has minimal radiation and barely audible
Grade 2	Soft, radiates more than grade 1
Grade 3	Moderate, radiates widely and easily audible
Grade 4	Moderate, radiates widely and more intense than grade 3
Grade 5	Loud, can be heard over entire thorax
Grade 6	Loud, can be heard without a stethoscope.

Table 1. Grading of heart murmurs.

Ventricular septal defect (VSD) is a hole in the ventricular wall. This is known as a shunt. The blood usually travels from the high pressure chamber of the left ventricle to the lower pressure chamber of the right ventricle. Echocardiogram is required as the grade of the murmur sometimes does not correlate to the size of the shunt. The shunt may be restrictive which means the defect is very small and nothing to worry about but can cause a very loud murmur on auscultation.VSDs can be common in cats. Transcatheter surgery is possible.

Atrial septal defect is similar to above but there is a shunt in the atria. Again, blood flows from a higher pressure chamber of the left atrium to a lower pressure chamber of the right atrium. Echocardiogram is required to determine the size of the defect and transcatheter surgery is possible.

In both septal defects above, the blood flow is usually left-sided to right-sided due to its respective pressures. In time, pressures can build up on the right hand side and become higher than the left side, which is known as a reverse shunt as the blood flow changes direction. Main signs to observe on clinical examination would be cyanosis and polycythaemia. If this happens the prognosis is poor. Patent ductus arteriosus is a condition where there is communication between the pulmonary artery and the aorta. Blood flows from the aorta into the pulmonary artery, which in time can cause left-sided heart failure. Pulmonary hypertension is a common subsequence of this condition and a reverse PDA can be observed where the blood flows from the pulmonary artery to the aorta due to increased pressures in the pulmonary artery, with the most common clinical sign of this being cyanosis/cold extremities. Surgery can be curative for this condition if caught early. Surgical ligation or catheter-based transvenous occlusion can be carried out if the shunt is left-right. If this type of continuous murmur is noted on clinical examination, investigations should be done as soon as possible to get the best outcome for the puppy.

Tricuspid valve dysplasia is due to valves developing abnormally, usually ending up being stenotic and not opening and closing appropriately. This can cause volume overload in the right side of the heart and therefore can lead to right sided heart failure.

If echocardiography is not an option to differentiate innocent versus congenital murmur straight away, NT-proBNP

Cardiac Condition	Predisposed Breeds	Murmur location/type	Clinical signs
Pulmonic Stenosis (PS)	English/French Bulldogs, Miniature Schnauzers, Boxers, Labradors	Left cranial heart base, rib 2-4, harsh systolic sounds, grade 3+	None or fatigue, syncope, ascites
Aortic Stenosis (AS)	Golden Retrievers, Newfoundlands, Boxers	Left cranial heart base, rib 4-5, harsh systolic, grade 3+ radiating cranially +/- weakened femoral pulses	None or fatigue, syncope, respiratory issues
Ventricular Septal Defect (VSD)	English Bulldogs, Beagles, Springer Spaniels	Right sternal border at heart base, harsh systolic, grade 3+	None or fatigue, coughing, syncope
Patent Ductus Arteriosus (PDA)	Maltese, Toy Poodles, Chihuahuas, Pomeranians	Left cranial heart base, rib 2-4 more dorsal than pulmonic region, harsh machinery like murmur, grade 3+ 'water hammer' bounding pulses	None or fatigue, exercise intolerance, growth retardation, cyanosis in reverse PDAs
Atrial Septal Defect (ASD)	Boxers, Dobermanns, Standard Poodle	Left heart base, over the pulmonic valve, grade 2+ can be soft ejection systolic murmur	None or fatigue, exercise intolerance, syncope, coughing
Tricuspid Valve Dysplasia	Labradors, English Springer Spaniels	Right sided, rib 3-5, grade 2+ can be soft systolic murmur	None of fatigue, exercise intolerance, ascites

Table 2. Congenital Cardiac Abnormalities in dogs.

can be used. It has been shown that NT-proBNP was significantly higher in dogs with congenital heart disease than those with an innocent murmur. Also, no differences were encountered between 'healthy' puppies compared to puppies with an innocent murmur. Unfortunately, this is not 100 per cent accurate as some puppies with severe pulmonic stenosis did not have a raised NT-proBNP level. Therefore, if there is a high suspicion of a congenital heart disease, an echocardiogram is the gold standard for diagnosis and management planning⁴.

References

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READER QUESTIONS AND ANSWERS

1. WHAT WOULD BOUNDING PULSES SUGGEST?

- A. PDA
- B. Flow murmur
- C. Myxomatous mitral valve disease
- D. Ventricular septal defect

2. WHEN SHOULD YOU RE-AUSCULTATE IF AN INNOCENT MURMUR IS DIAGNOSED AT FIRST CONSULTATION?

- A. In seven days
- B. Never
- C. Between seven days and six months later
- D. When they come in for their spay/castrate procedure

3. WHAT IS THE MOST COMMON ABNORMALITY FOUND IF A MURMUR IS HEARD ON THE RIGHT SIDE AND STERNAL BORDER?

- A. VSD
- B. PDA
- C. Pulmonic stenosis
- D. Aortic stenosis

4. WHERE ELSE IS ESSENTIAL TO AUSCULTATE IF A HIGH GRADE MURMUR IS FOUND AT THE LEFT HEART BASE THAT IS LINKED TO A CONGENITAL ABNORMALITY?

- A. Right apex
- B. Left apex
- C. Thoracic inlet
- D. Right base

5. IS THE DEGREE OF A MURMUR ALWAYS RELATIVE TO THE SEVERITY OF THE CARDIAC CONDITION?

- A. Yes
- B. No

ANSWERS: 1A; 2C; 3A; 4C; 5B.