

CPD article

How to maximise your auscultation technique

Auscultation is a cheap and easy diagnostic tool available in veterinary practice. Yet it often creates uncertainty, prompting both nurses and veterinary surgeons to seek second opinions amongst colleagues. The purpose of this article is to explore the best techniques for auscultation, and discuss the different sounds that can be heard in dogs and cats when listening to the heart. The starting point of auscultation is to identify normal heart sounds. This will then help recognise abnormal heart sounds, which can then be split into loudness, timing, and point of maximal intensity.

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Auscultation is a cheap and easy diagnostic tool available in every veterinary practice. Yet if we ask ourselves if it is used to its full potential, the answer is probably no. While it seems like an easy enough task to perform, it is frequently over complicated. Two things hinder auscultation technique. First, optimal listening conditions are rarely achieved; and second, cardiologists agree that recognising abnormal heart sounds, and gaining proficiency in the technique is difficult (Pedersen et al, 1999; Naylor et al, 2001; Ware, 2007).

Primarily, auscultation of the heart is used to record heart rate and rhythm, and to determine heart sounds. As with most things in life, practice is key, so that abnormal sounds can be readily distinguished from normal heart sounds. If abnormal sounds are heard, it is recommended to determine the timing of the additional sounds, the point of maximal intensity (PMI) — or where the sound is heard the loudest — and finally, the intensity or loudness of the sounds in relation to a grading system.

Equipment

There are a few different types of stethoscopes available on the market (*Figure 1*). The better quality stethoscopes are adequate for veterinary use. Paediatric stethoscopes are not recommended for most auscultation because a larger bell is needed to maximise amplification of heart sounds. The main components are ear pieces, tubing, bell, and diaphragm (*Figure 2*).



Figure 1. Examples of stethoscopes available for use in veterinary practice.

The binaurals should face forward (*Figure 3*) and be placed snugly into the ears. It may be necessary to move the tubing to better fit the ear canal and minimise sound leakage. Sound leakage and/or environmental sounds are a common problem when attempting to detect lower heart sounds or identify heart murmurs. The diaphragm is used to hear high-pitched sounds in the lungs and heart. It is best for heart sounds one and two (S1 and S2). The bell is used for lower-pitched heart sounds and extra heart sounds (S3 and S4). Some stethoscopes do not have a separate bell and diaphragm, and so fingertip pressure should be used to distinguish high and low pitched sounds.

Environment

Consider where the auscultation is to be performed. Ideally, a quiet room and gentle han-

dling is recommended, so as not to excite or distress the patient. Panting dogs can be a problem; gentle closing of the mouth can allow a few seconds of undisturbed auscultation. Sometimes cats may purr, which can make auscultation impossible. Holding a finger across the nose may stop purring for a moment, or turning on a tap near to the cat may provide some distraction. If the owner happens to be present during auscultation, it may need to be explained that silence is required for optimal auscultation. Owners quite often like to talk during quiet periods.

Technique

First, it is important to know what is expected to be heard. There are two normal heart sounds in the dog and cat:

- The 'lub' (S1), when the atrioventricular

valves close

- And the 'dub' (S2), when the semilunar valves close.

S1 is a louder, longer, and duller sound than S2. It is best heard in thin and young animals, or those with high sympathetic tone, and those with tachycardia, mitral regurgitation, systemic hypertension, or anaemia. S2 is a shorter higher pitched sound, which is loudest over the pulmonic and aortic areas. Any other sounds are described as additional heart sounds. These extra sounds are described by location (the PMI), timing in the cardiac cycle, and intensity of the sound (loudness). *Table 1* outlines the PMI in dogs and cats.

Timing of additional heart sounds is important. Sounds heard between S1 and S2 occur during systole. This is the most common type of heart murmur recorded in small animals. Sounds heard between S2 and S1 are diastolic. Diastolic murmurs are rare in small-animal medicine. Murmurs throughout systole and diastole are called continuous murmurs. The most common cause of a continuous murmur is a patent ductus arteriosus. Distinguishing when additional heart sounds occur, will help the veterinary surgeon to focus their differential diagnosis. An approach, such as the one described below, should be followed to reliably perform auscultation:

- A systematic approach should be used from the start. The patient should be in a standing position in a quiet room (*Figure 4*)
- Both sides of the entire thorax should be auscultated
- The heart should be auscultated separately from the lungs
- First, the heart rate and rhythm should be noted. It should also be noted whether respiratory pattern changes the rate or rhythm
- It is critical to recognise normal heart sounds, S1 and S2 in the patient, or the 'lub' and 'dub'. Time should be taken to be sure
- If extra heart sounds are identified, the next steps are to localise and identify the PMI, timing, and intensity. *Figure 5* shows PMI location
- All valve areas, should be auscultated in order if possible. Time should be taken to listen to the pulmonic, aortic, mitral, and tricuspid areas. Starting with the pulmonic area of the left side of the thorax, the stethoscope should be moved from base to apex (*Figure 6*). It may be necessary to move the left leg forward so that the third



Figure 2. Labelled diagram of a stethoscope.

intercostal space, the site of the pulmonic valve, can be better heard

- To maximise the area of the aortic valve, the stethoscope should then be moved slightly upwards and back one intercostal space. It may not be possible to distinguish the aortic and pulmonic areas in small dogs and cats
- The sternum in cats should also be auscultated
- Still on the left side of the thorax, the stethoscope should then be moved a little lower to the level of the costochondral junctions at the fifth to seventh intercostal spaces. This is the PMI of the mitral valve
- Next, the stethoscope should be placed on the right side of the thorax between the third to fifth intercostal spaces, again at the level



Figure 3. This image shows how to place the ear pieces into the ears correctly.

Table 1. PMI locations in the dog and cat

Structure	Location
Mitral valve (left apex)	Dog – left side, 5th intercostal space at costochondral junction. Cat – left side, 5th–6th intercostal space, near sternum
Aortic valve (left base)	Dog – left side, 4th intercostal space, just above costochondral junction
Pulmonic valve (left base)	Dog – left side, 2nd–4th intercostal space, just above sternum. Cat – left side, 2nd–3rd intercostal space, one third of the way up from sternum
Tricuspid valve (right apex)	Dog – right side, 3rd–5th intercostal space near costochondral junction Cat – right side, 4th–5th intercostal space near sternum

Adapted from: Gompf, 2015: 17



Figure 4. Good auscultation technique

- of the costochondral junctions (Figure 6). This is the PMI for the tricuspid valve
- Timing of the additional heart sounds needs to be noted. To help identify when systole occurs, a pulse should be palpated at the same time as auscultation. An arterial pulse should be felt during systole, between S1 and S2
- Finally, the intensity, or loudness should be noted. Table 2 shows the grading system used in small animals
- Common artefacts that can hamper auscultation include shaking, movement, panting, purring, and increased respiratory noise. The patient should be calmed as much as possible to create optimal listening conditions.

Grading

The loudness of a heart murmur is graded between I and VI (Table 2). Grading can be useful to assess disease progression and/or severity of certain cardiac conditions, such as aortic or pulmonic stenosis or mitral regurgitation. However, it is less useful to assess myocardial disease severity. Furthermore, ventricular septal defects will give a louder sound when the hole is smaller because of the higher pressure across the hole. Therefore, grade does not always indicate disease severity.

It is also important to remember that veterinary professionals will not always agree on the presence or loudness of a murmur. Pedersen et al (1999) conducted a study evaluating different people and their auscultation. The study used dogs diagnosed with mitral valve disease, and they found that interobserver agreement on presence and absence of mildly-diseased dogs varied between 63–88%. In a similar study, Höglund et al (2004) showed high interobserver variance in dogs with aortic stenosis. Another study looking at the comparison of cat cardiac auscultation, showed only moderate interobserver agreement (Wagner et al, 2010).

What is a murmur?

A murmur can be best described as an abnormal heart sound of prolonged duration (Ware, 2007). Blood flow normally passes through blood vessels and the heart with minimal turbulence, which does not cause a murmur. A murmur arises from a vibration of structures within the heart, created by high velocity, abnormal blood flow, turbulence or reduced blood viscosity. Heart murmurs can occur without the presence of heart disease. Innocent or physiological murmurs can be quite normal for puppies and kittens, and disappear by the age of 6 months. These murmurs are usually left sided and between grades I–III/



Figure 5. PMIs on the left (A) and right (B) side of the thorax. AV, aortic valve; PV, pulmonic valve; MV, mitral valve; TV tricuspid valve



Figure 6. Move the stethoscope from base to apex starting with the left side of the thorax.

VI. Innocent murmurs can still be present in adult cats and dogs, but if no disease is suspected, no treatment is required.

Also, in cases of severe anaemia a heart murmur can be caused by low viscosity of the blood. When the anaemia is corrected, the murmur can disappear. Heart murmurs caused by heart disease are seen when there is an obstruction to blood flow, seen with aortic stenosis, or valvular incompetence such as mitral valve disease. For a summary of heart murmur causes see Table 3.

Other heart sounds

Occasionally, it is possible to hear other heart sounds. These sounds, either an S3 or S4, are known as gallop sounds. They are lower pitched than the S2 sound and, when heard, can sound like a galloping horse. They are both heard in diastole; distinguishing one from the other is very difficult, and requires some experience and practice. An S3 sound occurs because of ventricular dilation and myocardial failure. It can sometimes be heard in dilated cardiomyopathy, or advanced valvular heart disease. An S4 sound is associated with atrial contraction in dogs and cats that have abnormal ventricular relaxation and stiffness. In cats, it can be heard with advanced hyperthyroidism or hypertrophic cardiomyopathy. Sometimes, it can be a transient finding in older, stressed, or anaemic cats.

When a heart murmur is detected in a cat or dog

As already discussed, a heart murmur does not always signify heart disease. For example, a 2010 study in healthy cats, showed that 34% of apparently healthy cats had heart murmurs (Wagner et al, 2010). The same study also showed that of those recorded as having a murmur, only half had heart disease on echocardiographic examination. Furthermore, of those that did not have a heart murmur, 16% did have heart disease when echocardiography was performed.

Payne et al (2010) even showed that a heart murmur was a good prognostic indicator in cats. However, in dogs with mitral valve disease, heart murmurs can be an indicator of disease severity; for example, the more degeneration of the mitral valve, the louder the murmur. However, a study published in 2015 showed that only 46% of dogs with mitral valve disease died as a result of their disease (Lopez-Alvarez et al, 2015). They also showed that a murmur of grade III/VI or above was associated with a higher risk of mortality.

Conclusion

As with many things in life, practice makes perfect in the case of carrying out auscultation. Using a quiet room with a standing, calm and complicit animal is recommended. Using a systematic approach is helpful, starting with heart rate and rhythm, then recognising normal heart sounds, moving from left to right side across the thorax, focusing auscultation over the PMI areas.

If a murmur or additional heart sounds are auscultated, location, timing and intensity

Table 2. Heart murmur grading

Intensity	Grade	Loudness
Low intensity	I	Low intensity murmur heard in a quiet environment only after careful auscultation over a localised cardiac area
	II	Low intensity murmur heard immediately when the stethoscope is placed over the PMI
Moderate intensity	III	Murmur of moderate intensity
	IV	High intensity murmur that can be auscultated over several areas without any palpable precordial thrill
High intensity	V	High intensity murmur with a palpable precordial thrill
	VI	High intensity murmur with a palpable precordial thrill that may even be heard when the stethoscope is slightly lifted off the chest wall

Adapted from: Kwart, 2010: 22

Table 3. Causes of heart murmurs

Heart disease	Flow murmurs	Other causes
Leaking valves (e.g. mitral valve disease)	Innocent murmurs	Anaemia
Stenotic valves (e.g. pulmonic stenosis)	Physiological murmurs	Hyperthyroidism
Holes in the heart (e.g. ventricular septal defects)		

KEY POINTS

- Using a calm and systematic approach will greatly assist auscultation technique.
- Regular practice will help identify abnormal and normal heart sounds.
- Identifying S1 and S2 is a crucial part of identifying other sounds.
- Heart murmurs can indicate heart disease, and should be noted in terms of location, timing and intensity, and the veterinary surgeon informed.
- Heart murmurs can be present without heart disease.

should be noted, recorded on the patient file, and highlighted to the veterinary surgeon. It is to be expected that there will be interobserver differences, but taking a calm and systematic approach will help reliability. A heart murmur can be an indicator of heart disease, but does not necessarily mean a death sentence. **VN**

Conflict of interest: none.

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