

How to Diagnose Aortic and Mitral Regurgitation in Older Horses: A Case-Based Approach

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The identification and interpretation of equine murmurs can be improved. In older horses, the two common degenerative valvular conditions are mitral and aortic regurgitation, which occur with approximate equal frequency. Mitral regurgitation produces a systolic murmur. These are often blowing in character. If the murmur occupies all of systole the pulse wave in a peripheral artery can be palpated at the same time the murmur is auscultated. Aortic regurgitation results in a diastolic murmur; loud aortic regurgitant murmurs usually occupy all of diastole, many contain harmonics and are musical in character. In these cases the peripheral pulse wave is palpated in the murmur free interval. Author's address: Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine, 52 Campus Drive, Saskatoon, Saskatchewan S7N 5B4, Canada. © 2002 AAEP.

1. Introduction

Although some studies show that over 80% of race horses have cardiac murmurs,¹ many practitioners have trouble identifying common heart murmurs.² In one study, most veterinarians could correctly identify heart sounds. However, when recordings of arrhythmia or murmurs were played, the ability to diagnose the underlying cardiac problem was only 53%, 33%, and 29% for diplomates of the American College of Veterinary Internal Medicine, equine practitioners, and undergraduates, respectively.² We are exploring methods to improve diagnostic accuracy using live horses with documented cardiac disease. This paper applies these results to the identification and differentiation of aortic and mitral regurgitation in older horses. These two murmurs heard over the left side of the heart are commonly caused by degenerative changes (endocardiosis) of the valve leaflets, the most common cause of cardiac pathology in older horses. This presentation uses

new information about the reliability of different examination techniques and annotated sound recordings to give accurate feedback about auscultation skills and improve learning.³

2. Materials and Methods and Results

Examination of the Cardiovascular System

Heart murmurs are usually low-frequency sounds at the lower limit of human hearing. They can be readily masked by extraneous noise, so auscultation should be carried out in a quiet area. Background sound makes it impossible to detect all but the loudest of cardiac murmurs. Stethoscopes vary slightly in quality. A key point to look for is earpieces that fit snugly, yet comfortably, in the ear canals. Ear pieces that are angled slightly give the best fit.

History taking should pay special attention to age, level of training and fitness, problems with exercise tolerance, and increased respiratory rate or cough.

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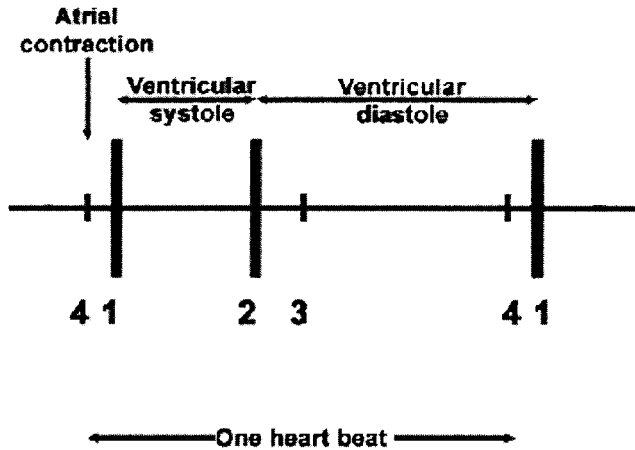


Fig. 1. Schematic representation of equine heart sounds, represented by vertical bars. The vertical axis is intensity (loudness); the horizontal axis time. Numbers correspond to the names of the individual heart sounds. S1 is produced by closure of the mitral and tricuspid valves, S2 by closure of the aortic and pulmonary valves, S3 is the ventricular filling sound, and S4 is the atrial contraction sound.

Examination of the cardiovascular system includes the color of the mucous membranes, capillary refill time, pulse rate, pulse strength, and the degree of jugular distension. The heart should be auscultated in a systematic fashion. It is easiest to start on the left side, over the mitral valve area. Sometimes this is located from anatomic landmarks—it lies in the fifth intercostal space just below the point of the shoulder. Many prefer to identify the mitral valve area by palpating the apex beat. This is the area where the contracting ventricle produces a vibration on the chest wall. It can be identified either by placing the palm of the hand over the thorax or by feeling the vibration transmitted through the head of the stethoscope as it rests on the chest. Either way, the apex beat lies close to the mitral valve. At the apex beat, the first heart sound, S1, produced by closure of the atrioventricular valves (mitral on the left, tricuspid on the right) at the beginning of ventricular systole, is loudest (Fig. 1). As the stethoscope is moved cranially, the aortic and pulmonic valves are ausculted in turn, and the second heart sound, S2, produced by closure of these valves at the end of ventricular systole, becomes relatively louder. When present, the third heart sound, S3, produced by ventricular filling, should be loudest over the apex, while the fourth heart sound, S4, produced by atrial contraction, is loudest over the base. Examination on the right side should include auscultation at the base, over the tricuspid valve area, and toward the apex, where murmurs from ventricular septal defects are loudest.⁴⁻⁷ Variations in rhythm are common in horses. Sinus arrhythmia, characterized on auscultation by subtle variations in rate and intensity of the heart sounds, often in response to changes in respiration, is com-

mon. Second degree atrioventricular block, characterized by a semi-predictable absence of the S1, S2, and S3 heart sounds for one, or rarely two, beats is also frequently observed in resting horses. In normal horses, this disappears during exercise but can return early in the recovery phase.

Description of Cardiac Murmurs

Grade or Intensity

All murmurs are caused by turbulent blood flow. This produces vibrations that are transmitted through the thoracic wall where they can be detected as sound waves, or in very severe cases, as a thrill. The intensity of a murmur can be graded on a 6-point scale: grade 2 murmurs are heard as soon as the stethoscope head is placed over its point of maximal intensity, grade 3 murmurs are easily detectable, and grade 5 or more murmurs are accompanied by a palpable thrill in the thoracic wall. Grade 6 murmurs can be heard when the stethoscope is no longer touching the body wall and will radiate all over the thorax. Most descriptions of the grade of murmurs caused by cardiac pathology refer to the intensity of the murmur in resting horses with no other disease processes. Murmurs of grade 3 intensity or greater are more likely to be the result of cardiac pathology, such as valvular degeneration, than quieter murmurs, which are often functional. Murmurs in horses that are anemic or suffering cardiovascular compromise, e.g., from colic, often disappear or become much less intense when the underlying problem is corrected and do not necessarily reflect cardiac pathology. Exercise may also increase the intensity of murmurs.

Duration

Murmurs may occupy part of systole or diastole and are described as early, middle, or late. Holo systolic or diastolic murmurs occupy the whole of systole or diastole, whereas pan murmurs also oblit-

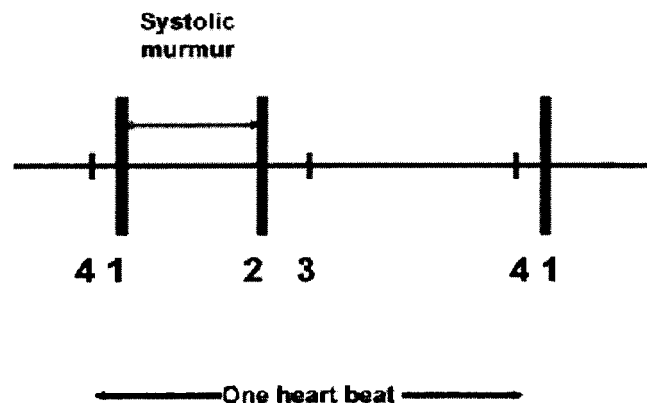


Fig. 2. Schematic representation of a systolic murmur (gray line). Numbers represent heart sounds; time is along the horizontal axis.

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Table 1. A Guide to the Identification of Common Cardiac Murmurs in Horses

Etiology	Signalment	Grade	Location, Character	Point of Maximal Intensity
Systolic outflow murmur	Any, especially foals and fit horses	1 to 3	Systolic, blowing	Left heart, aortic valve
Diastolic filling murmur	Especially younger, fit, racing horses	1 to 2	Diastolic between S2 and S3, squeak	Right or left apex
Patent ductus arteriosus	Young foals	2 to 5	Continuous, machinery	Left heart, pulmonic valve
Ventricular septal defect	Foals, adult horses	2 to 5	Systolic, blowing	Right heart apex, left heart pulmonic area
Tricuspid regurgitation (usually functional)	Especially common in adult horses in race training	1 to 3	Systolic, blowing	Right heart, tricuspid area
Mitral regurgitation (functional)	Especially common in adult horses in race training	1 to 3	Systolic, blowing	Left heart, mitral area
Mitral insufficiency (degenerative)	More common in older horses	2 to 6	Systolic, often blowing	Left heart, mitral area
Aortic insufficiency	Especially older horses	2 to 6	Diastolic, often honking, musical or buzzing	Left heart, aortic area. Loud murmurs usually radiate to the right side as well.

erate the heart sounds. Many murmurs caused by aortic or mitral valvular degeneration are holo- or pan-type murmurs.

Shape refers to the pattern of intensity change over time. Aortic regurgitant murmurs are often described as being decrescendo, meaning they are perceived to become less intense in the later part of the murmur. In contrast, mitral valve regurgitation murmurs are often fairly uniform in intensity and are described as band- or plateau-shaped murmurs (Fig. 2).

Character or pitch is a function of the pattern of frequencies within a murmur. At least two different systems exist to describe character, which makes communication difficult because both use the term musical with different meanings. To determine which terms are in common usage, we played a selection of aortic and mitral regurgitant murmurs to 20 students and 20 diplomates. Overall, a total of 30 different terms were used to describe the seven murmurs; some clinicians used a particular term in opposite ways than others. Diplomates used a smaller group of terms than students, which makes communication between themselves more standardized. Only four terms were found to have a generally recognized meaning. Honking, buzzing, and musical were used to describe murmurs with a harmonic frequency pattern. Blowing was used to describe murmurs without harmonics. Equine practitioners should try to restrict themselves to this small group of terms when describing murmurs. Equine murmurs that are buzzing, honking, or musical are most likely to be caused by aortic regurgitation. Mitral cases and about one-half of the cases of aortic regurgitation are commonly blowing in character.

Location in Cardiac Cycle

Placing a murmur correctly in systole or diastole is essential to diagnosis of degenerative valvular dis-

ease in older horses because about one-half the cases affect the mitral valve and produce a systolic murmur, whereas aortic regurgitation produces a diastolic murmur. In dogs, most cardiac murmurs are systolic. This may explain the tendency for inexperienced clinicians to call all murmurs systolic. However, in old horses, the diastolic murmur of aortic regurgitation occurs about as commonly as mitral regurgitation. There are a number of different methods of distinguishing systole and diastole. For murmurs that occupy only a small part of systole or diastole, positioning the murmur in relation to the heart sounds is probably the best method of localizing the murmur. Our research shows that, for a variety of reasons, this method is not accurate with murmurs that occupy all of systole or diastole. For long, holo- or pan-type murmurs, a useful method is to listen to the murmur while feeling the pulse; systolic murmurs are heard coincident with the pulse and diastolic murmurs occur in the pulse-free interval.

Based on the history and the above physical findings, it is often possible to correctly identify the underlying problem (Table 1).

Examples

Case 1 is from a normal horse. It is meant to familiarize us with the capabilities and limitations of the auditoriums sound reproduction equipment.

For the following cases listen to the recordings and describe the following features:

- Identify heart sounds
- Describe the rhythm
- Is a murmur present?

1. Grade of murmur
2. Location in cardiac cycle
3. Point of maximal intensity

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4. Duration
5. Character
6. Shape

Case 2 is a 20-yr-old quarter horse that presented with a very large mass over its left gluteal muscle. This was subsequently drained of many liters of pus. On physical examination, the respiratory rate was 30 breaths/min, the heart rate was 60 beats/min, and the rectal temperature was 37.8°C. There was a loud murmur recorded over the left thorax. How would you describe this recording? What is your tentative diagnosis?

Case 3 is a 26-yr-old Thoroughbred stallion. He was presented because he was thin and no longer getting his mares pregnant. He has points on his teeth and some oral ulcers. A cardiac murmur was first detected 4 yr ago. The recording is made over the left heart. How would you describe this recording? What is your tentative diagnosis?

3. Discussion

For many, the stethoscope is the symbol of the veterinarian. Although it has been used for over 100 yr, it is only recently that we have been able to accurately assess its reliability. Auscultation and examination can be an accurate method of making a diagnosis of the underlying cardiac problem. However, diagnostic accuracy can be improved by using a standardized terminology and placing more emphasis on specific clinical find-

ings. Investigation of the accuracy of different examination techniques and the use of multimedia instructional materials, such as those used in this seminar, allow more effective feedback and will improve the ability of equine practitioners to identify mitral and aortic regurgitation.

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References

1. Kriz NG, Hodgson DR, Rose RJ. Prevalence and clinical importance of heart murmurs in racehorses. *J Am Vet Med Assoc* 2000;216:1441-1445.
2. Naylor JM. *Hearing horse hearts: an interactive guide to equine cardiac auscultation*. Saskatoon, Canada: Vet Visions Inc., 2000.
3. Abbott J. Auscultation: what type of practice makes perfect? *J Vet Intern Med* 2001;15:505-506.
4. Physick-Sheard PW. Examination of the cardiovascular system. In: Colahan PT, Mayhew IG, Merritt AM, et al., eds. *Equine medicine and surgery*, 5th ed. St. Louis, MO: C.V. Mosby, 1999;296-312.
5. Bonagura JD, Reef VB. Cardiovascular examination of the horse: general approach. In: Reed SM, Bayly WM, eds. *Equine internal medicine*. Philadelphia: W.B. Saunders Co., 1998;298-306.
6. Littlewort MCG. The clinical auscultation of the equine heart. *Vet Rec* 1962;74:1247-1257.
7. Naylor JM. *The art of equine auscultation*. Saskatoon, Canada: Vet Visions Inc., 2001.