

# Cardiac failure in young horses: A case report

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Cardiac disease is a relatively uncommon condition in the horse. Nevertheless, it should be considered as a differential in any horse presenting with consistent clinical signs, which range from non-specific signs such as a history of poor performance, lethargy, weight loss and inappetence, to more specific signs of cardiac failure such as significant murmur or arrhythmia, jugular distension and pulsation, respiratory distress and coughing, ventral oedema and diarrhoea.

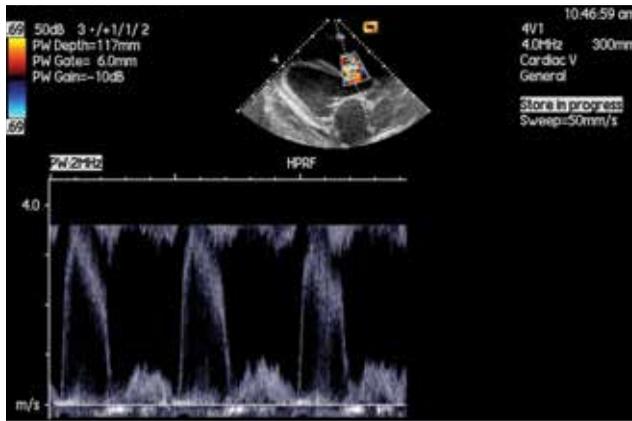
The following two case reports compare the clinical and diagnostic findings in two young horses that presented to the University College Dublin (UCD) Veterinary Hospital with clinical signs consistent with cardiac failure of two distinct aetiologies.

## **CASE 1: VENTRICULAR SEPTAL DEFECT (VSD) IN A FOUR-YEAR-OLD COB PONY**

A four-year-old cob pony presented to UCD Veterinary Hospital for investigation of a cardiac murmur accompanied by severe weight loss over a period of six weeks and a three-week history of diarrhoea. The pony had been acquired by the owners at two-years-of-age in poor body condition. The owners reported that it was difficult to

maintain the pony in good body condition, but there was no history of overt disease prior to the current episode. Empirical treatment with anthelmintics had no effect. On physical examination at UCD Veterinary Hospital the pony was noted to be lethargic and emaciated with a body condition score of 1/5 along with faecal staining of the hind limbs. Mucous membrane colour and CRT were unremarkable. Pitting oedema was noted over the ventral thorax. Bilateral, severe jugular distension and pulsation was apparent along the entire length of the jugular veins. On auscultation of the heart, a loud pan-systolic murmur (grade 5/6) with a point of maximal intensity (PMI) on the right side of the thorax was auscultated. The murmur could also be heard on the left side of the thorax, and it was accompanied by a bilateral precordial thrill. The pony was tachycardic with heart rate ranging from 44-70bpm over the course of hospitalisation.

An echocardiogram was performed to evaluate cardiac structure and function. A ventricular septal defect was observed high up in the membranous part of the inter-ventricular septum. Blood could be seen shunting from the left to right ventricle, resulting in right ventricular overload (Figure 1). Marked tricuspid regurgitation was seen as



**Figure 1:** Pulse wave and colour flow Doppler US demonstrating blood flow across the VSD from the left ventricle to the right ventricle.

a consequence of right ventricular enlargement. A small volume of pericardial fluid was seen surrounding the heart in the pericardial space.

The pony was euthanised and the diagnosis was confirmed post mortem. The heart was grossly enlarged. In addition to the large septal defect, there was diffuse thickening of the endocardium of the left ventricle (endocardial fibro-elastosis). Marked hepatomegaly was present. The size of the defect was 4cm. Approximately 50L of free fluid was recovered from the abdomen. Given the size of the defect, it is likely that clinical signs of disease would have become apparent at a much earlier stage had the animal been required to perform athletic activities.

## CASE 2: BACTERIAL ENDOCARDITIS IN A THREE-YEAR-OLD THOROUGHBRED GELDING

A three-year-old Thoroughbred gelding presented to UCD Veterinary Hospital for investigation of a cardiac murmur accompanied by a three-week history of acute severe weight loss, lethargy, respiratory distress, jugular distension and pulsation. Intermittent pyrexia was also reported. A presumptive diagnosis of bacterial endocarditis had been made and treatment with broad spectrum systemic antimicrobials had been administered prior to referral. No clinical response was observed. On physical examination the gelding was noted to be emaciated (body condition score of 1/5). Pitting



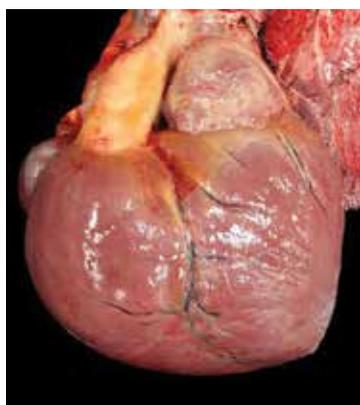
**Figure 2:** Right parasternal long axis view of the heart oriented to visualise the aortic valve.

oedema was seen over the ventral body wall and in the preputial region. Mucous membrane colour and CRT were unremarkable. Bilateral jugular distension and pulsation was observed. Heart rate was elevated at 88bpm. A grade 4/6 diastolic murmur was auscultated on the left side of the chest. The PMI of the murmur was located at the fourth intercostal space, over the region of the aortic valve. All other vital parameters, including body temperature, were normal on admission. No joint effusion was noted.

Haematology showed anaemia (PCV 23.8%), a mild leucocytosis ( $10.38 \times 10^9/L$ ) and a mature neutrophilia ( $8.38 \times 10^9/L$ ). Fibrinogen levels were elevated at 5g/L. These findings were consistent with chronic infection or inflammation. Echocardiography revealed marked stunting and thickening of the right coronary cusp of the aortic valve, consistent with endocarditis. Stunting was so severe that the affected valve leaflet failed to approach the borders of the two remaining aortic valve cusps, resulting in marked aortic regurgitation (Figure 2). Incidental regurgitation was noted in the mitral, pulmonic and tricuspid valves, but gross lesions were not visualised on the echocardiogram. A small volume of anechoic pericardial fluid was seen in the pericardial space. Electrocardiography revealed no electrical abnormalities. In light of the grave prognosis for normal cardiac function and athletic performance, the animal was euthanised.

**Table 1:** Summary of the clinical and diagnostic findings in two young horses presented to the UCD Veterinary Hospital for investigation of cardiac failure.

	Animal	Clinical Presentation	Cardiac signs	ECG	Echocardiography	PM
Ventricular septal defect	Four-year-old pony	Acute severe weight loss BCS 1/5 Lethargy	<ul style="list-style-type: none"> <li>Grade 5/6 pan-systolic murmur:</li> <li>PMI RHS near sternum</li> <li>Ventral oedema</li> <li>Jugular distension</li> <li>Jugular pulsation</li> <li>Diarrhoea</li> </ul>	Not done	<ul style="list-style-type: none"> <li>VSD</li> <li>RV enlargement</li> <li>Tricuspid regurgitation</li> <li>Pericardial fluid</li> </ul>	<ul style="list-style-type: none"> <li>VSD</li> <li>RV enlargement</li> <li>Endocardial fibro-elastosis</li> <li>Hepato-megaly</li> <li>Peritoneal fluid</li> </ul>
Bacterial endocarditis (Aortic Valve)	Three-year-old TB gelding	Acute severe weight loss BCS 1/5 Lethargy Intermittent fever	<ul style="list-style-type: none"> <li>Grade 4/6 diastolic murmur:</li> <li>PMI LHS 4th ICS near heart base</li> <li>Ventral oedema</li> <li>Jugular distension</li> <li>Jugular pulsation</li> </ul>	Tachycardia	<ul style="list-style-type: none"> <li>Stunting and thickening of the right coronary cusp of the aortic valve</li> <li>Aortic regurgitation</li> </ul>	<ul style="list-style-type: none"> <li>Chronic valvular endocarditis</li> <li>Pericardial and pleural fluid</li> <li>Congested liver</li> <li>Renal infarcts</li> </ul>



**Picture 1:** Heart of cob with VSD showing dilation and thickening of the right ventricle along with dilation of the pulmonary artery.



**Picture 2:** Severe focal vegetative endocarditis.

At post mortem examination, body fat reserves were depleted. Red tinged fluid was present in the pleural and pericardial spaces. The aortic valve had focal marked proliferative valvular endocarditis. The left AV valve was diffusely mildly thickened with multifocal areas of intra-valvular haemorrhage. The liver was diffusely congested. There were a few wedge-shaped firm white foci in the left renal cortex (infarcts). The renal infarcts likely occurred secondary to dissemination of septic emboli from the endocarditis lesions. Samples were collected from the aortic valve for microscopic evaluation and for microbiological culture. No bacterial organisms could be seen or grown from the lesion. Histo-pathological evaluation of the valvular lesions confirmed the diagnosis as severe chronic valvular endocarditis.

## DISCUSSION

These case reports specifically outline the presentation and investigation of two different causes of overt heart failure in young horses.

Table 1 summarises the pertinent clinical and diagnostic

findings for both cases. Table 2 outlines the similarities and differences between horses affected with ventricular septal defects and bacterial endocarditis. It is intended to aid the practitioner in differentiating between the two conditions. It is important to realise that not all of the findings will be present in all cases, and that the clinical findings observed will vary according to the stage of disease at which the animal presented.

The prognosis for horses affected with endocarditis varies depending on the stage of disease at the time of presentation. For example, animals presented early in the disease course may be responsive to aggressive and directed antimicrobial treatment, typically employed for a minimum period of four-to-six weeks (1). However, invariably disease is detected at a more advanced stage of disease by which time irreversible valvular damage has occurred.

The prognosis for horses affected with VSDs varies depending on the size of the defect and the level to which

**Table 2:** Comparing and contrasting the clinical findings expected in cases of VSD and bacterial endocarditis.

Clinical Finding	Bacterial Endocarditis	VSD
Pyrexia	Fever is present in almost all cases of infective endocarditis (4). It may be intermittent or continuous.	Not a feature of the condition.
Murmur	The aortic and mitral valves are most commonly affected. A diastolic murmur with a PMI over the region of the aortic valve is commonly found. Involvement of the mitral valve would produce a systolic murmur.	Grade III-IV holo- to pansystolic murmur with a PMI over the tricuspid valve region radiating towards the right sternal border +/- a secondary murmur in the region of the pulmonic valve due to relative stenosis of the valve.
Metastatic infection	May develop as a consequence of embolism of septic emboli from the affected heart valve. Common sites include the joints and the kidneys.	Not a feature of the condition.
Weight loss	Non-specific finding. Alternative aetiologies include dental disease, parasite infestation and malnutrition.	
Lethargy	Non-specific finding.	
Diarrhoea	Non-specific finding. May be a feature of end stage cardiac disease due to vascular congestion of abdominal viscera.	
Tachycardia	Non-specific finding. Potential cardiac aetiologies include excitement, endocarditis, septal defects, tachyarrhythmias, valvular endocardiosis, and cardiomyopathies.	
Jugular distention and pulsation	Jugular distension is one of the earliest indicators of congestive heart failure. In normal horses, slight pulsation may be seen at the thoracic inlet (2). Jugular pulsation and distension are non-specific findings.	
Ventral oedema	A feature of end stage cardiac disease. Consider alternative aetiologies, including vasculitis and hypo-proteinemia.	

the animal is required to perform. Horses with a small defect can go on to pursue successful athletic careers, whereas those with more extensive lesions are likely to succumb to cardiac failure at an earlier stage (2). A lesion size of >2.5cm has been reported as being associated with an unfavourable prognosis in Thoroughbreds while in other breeds a defect size of >one-third the diameter of the aorta is associated with a poor prognosis (3).

### SUMMARY

The nature of the murmur and specific clinical signs, such as pyrexia, were the most useful clinical parameters in differentiating the likely aetiologies of the disease processes in these two cases. However, pyrexia may not always be present in a chronic case of endocarditis. Echocardiography was most useful to confirm the suspected underlying disease process

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### ACKNOWLEDGEMENTS

With thanks to Dr. Alan Wolfe, Mrs. Cliona Skelly and Mr. Brian Cloak for assisting with the article, the cases and for providing images for the article.

## Reader Questions and Answers

### 1. THE MURMUR ASSOCIATED WITH AORTIC VALVE ENDOCARDITIS IN HORSES IS BEST DESCRIBED AS FOLLOWS:

- A diastolic murmur with a PMI over the 4th intercostal space on the right hand side.
- systolic murmur with a PMI over the 4th intercostal space on the left hand side.
- diastolic murmur with a PMI over the 4th intercostal space on the left hand side.
- systolic murmur best heard over the right side of the chest radiating towards the sternal border.

### 2. THE MURMUR ASSOCIATED WITH A VSD IN THE HORSE IS BEST DESCRIBED AS FOLLOWS:

- diastolic murmur with a PMI over the 4th intercostal space on the right hand side.
- systolic murmur with a PMI over the 4th intercostal space on the left hand side.
- diastolic murmur with a PMI over the 4th intercostal space on the left hand side.
- systolic murmur best heard over the right side of the chest radiating towards the sternal border.

### 3. THE MOST USEFUL CLINICAL FINDING FOR DIFFERENTIATING BETWEEN CARDIAC DISEASE ASSOCIATED WITH A VSD OR VALVULAR ENDOCARDITIS IS AS FOLLOWS:

- The nature of the murmur.
- The presence or absence of jugular pulsation.
- The presence or absence of pyrexia.
- The presence or absence of diarrhoea.

### 4. THE PROGNOSIS FOR TB HORSES AFFECTED WITH VSD IS

- Excellent
- Unfavourable if the defect is >2.5cm
- Always guarded
- Unfavourable if the defect is <2.5cm

### 5. WHICH OF THE FOLLOWING STATEMENTS IS MOST ACCURATE?

- Successful treatment of endocarditis in the horse is hampered by:
- The advanced nature of disease at time of detection.
- Inability of antimicrobial drugs to penetrate the inflamed tissue.
- Irreversible physical changes to the valve that interfere with its functionality.
- A combination of (a), (b) and (c).

ANSWERS:  
Q1: (C); Q2: (D); Q3: (A); Q4: (B); Q5: (D)