

## A CASE OF PERICARDITIS IN ANGUS CATTLE

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### Abstract

A 10-years-old Angus cow was evaluated on the field for suspected traumatic pericarditis. Physical exam findings included tachycardia, mixed dyspnea, decreased intensity of heart sounds on the left, absence of heart sounds on the right but presence of fluid sounds, bilateral turgidity of the jugular veins, positive venous compression test, brisket and ventral abdominal oedema. The cow exhibited light pain while palpation at brisket region. Hematology revealed significant erythrocytopenia, higher hematocrit, lower hemoglobin concentration, significant leukocytosis with neutrophilia and lymphocytopenia. Serum biochemical findings had reduced glucose, urea nitrogen, albumin, sodium, potassium, chloride, calcium, phosphorus levels and increased levels of AST, ALT, GGT, total protein and globulin. Ultrasonography has shown pericardial effusion and strands of fibrin. The prognosis was poor, and pericardiocentesis or pericardiotomy were inadequate methods of treatment, thus euthanasia was indicated.

**Key words:** traumatic pericarditis, bovine, ultrasound

Pericarditis is an inflammation of the pericardium that results in the accumulation of serous or fibrinous inflammatory products between the visceral and parietal pericardium. It can be caused by trauma from ingested foreign objects (nails, needles, wire), external injuries, hematogenous spread of infectious diseases (colibacillosis, pasteurellosis, salmonellosis and anaerobic infections) (Grunder H.D., 2002), neoplastic effusion secondary to a lymphoma or a mesothelioma (Takasu M. et al., 2006), and idiopathic aseptic pericarditis (Jesty S.A. et al., 2005; Firshman A.M. et al., 2006).

In cows, pericarditis is almost always attributable to a reticular foreign body that has penetrate the reticular wall, diaphragm and pericardial sac (Braun U., 2009). The primary clinical sign in susceptible cattle is tachycardia and the severity of this sign depends primarily on the degree of compression of the heart by pericardial effusion (Jesty S.A. et al., 2005). However, tachycardia may also be secondary to various disorders such as dehydration, anemia, hypoxemia, acid-base and metabolic disturbance, hypovolemia, pain, fever, excitement, stress, sepsis or toxemia.

This case report highlights the value of clinical exams and echocardiography for an antemortem diagnosis of pericarditis in cows.

### MATERIAL AND METHOD

A ten-years-old Angus cow was evaluated on the field for suspected traumatic pericarditis. The cow had been maintained on pasture with other 10 healthy cattle and had been apparently healthy until one month after calving, when the owner first noticed a sharply decreased milk production and diminished appetite. The veterinarian administered benzyl procaine penicillin and dexamethasone for 3 days. Its evolution was favorable, milk production increased a little but remained below normal for cows in their second month of lactation. Two months after calving, the owner noticed that the cow's brisket area was getting bigger and her milk production had dropped to 3-4 liters. The owner has contacted the specialists from Iasi University of Life Sciences. A complete clinical examination was performed. Whole blood and serum samples were collected to determine various hematological parameters and serum concentrations of aspartate aminotransferase (AST), urea nitrogen, gamma glutamyl transferase (GGT), total protein, alanine aminotransferase (ALT), albumin, glucose, sodium, potassium, chloride, calcium and phosphorus. Ultrasonographic examination of the heart has been performed on standing cow using a 5.0 MHz convex transducer from the third to fifth

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intercostal spaces in the cardiac region on both sides of the thorax.

## RESULTS AND DISCUSSIONS

Heart disease in cattle is a challenge for the clinician. The bovine heart is composed of three major structures that can be affected by various diseases: the pericardium, the myocardium and the endocardium. Various congenital anomalies of the heart occur in cattle as the result of defective septa and formation of the cardiac chambers during embryonic development (Buczinski et al., 2005). The most common congenital heart defect is the incomplete closure of the ventricular septum (Ohwada and Murakami, 2000; Buczinski et al., 2006). The most prevalent endocardial disease is infectious bacterial endocarditis mainly caused by *Trueperella pyogenes* or streptococci. The most prevalent disease of the myocardium is dilated cardiomyopathy which is a primary myocardial disorder (Nart et al., 2004). Secondary myocardial disorders include myocarditis following viral (Gunes et al., 2005), bacterial (Uzal et al., 2003; Haines et al., 2004) or parasitic infection, nutritional cardiomyopathy such as that caused by vitamin E/selenium or copper deficiency, and toxic cardiomyopathy secondary to ionophore toxicosis. Pericardial diseases include traumatic reticulopericarditis, pericarditis secondary to pleural or lung infection, neoplastic effusion secondary to a lymphoma or a mesothelioma, and idiopathic aseptic pericarditis (Buczinski S. et al., 2010).

The prognosis is traditionally said to be guarded to poor in bovine heart disease cases. However, diagnostic tools are available to detect cardiac disease before signs of heart failure appear. Auscultation is the most important part of the examination of the cardiovascular system in cattle, as most are examined in the field without access to additional diagnostic tools. This procedure should be carried out systematically with the aim of detecting normal heart sounds, cardiac murmurs and cardiac rhythm.

The Angus cow had as clinical signs tachycardia (100 bpm), normothermia, mixed dyspnea, decreased intensity of heart sounds on the left, absence of heart sounds on the right but presence of fluid sounds, bilateral turgidity of the jugular veins, positive venous compression test, brisket and ventral abdominal oedema (Figure 1 a,b,c), reduced rumen movement and positive pain tests.

The primary clinical sign in affected cattle is tachycardia. Sometimes the heart rate is only mildly elevated at 80–100 bpm; typically,

however, the heart rate is severely increased with rates as high as 130 bpm (Braun U., 2009). The severity of tachycardia depends mainly on the degree of compression of the heart by the pericardial effusion; in cows with idiopathic pericarditis, pericardiocentesis with fluid removal resulted in an immediate decrease in blood pressure, heart rate and recovery (Jesty S.A. et al., 2005).

Heart sounds are suppressed due to pericardial effusion and fibrinous changes in the pericardial sac. These abnormal sounds depend on the type of lesions (Grunder H.D., 2002). If fibrinous changes, the sound are of rubbing and scratching nature. With a predominance of fluid, there are splashing or gurgling sounds.

There is a variable degree of jugular vein distention, depending on the degree of cardiac tamponade (Jesty S.A. et al., 2005; Braun U. et al., 2007), as well as edema of the submandibular region, chest and ventral abdomen. Sometimes cattle stay with their elbows in abduction in an attempt to facilitate cardiac function. Elbow abduction can also be the result of pain. It is possible that oedema and jugular vein distention may not be present if pericardial fluid drains into the reticulum via a patent foreign body tract (Grunder H.D., 2002). Clinical signs of heart failure in cattle include syncope, exercise intolerance and weakness (De Moraes and Schwartz, 2005). Congestive heart failure can be distinguished from heart failure by the presence of effusion and oedema, which are the result of increased hydrostatic pressure and fluid retention (Reef and McGuirk, 2002).

The general behavior, condition and appetite of cattle with traumatic pericarditis are always abnormal. Cattle often show signs of pain, such as bruxism and grunting, and fever. Absence of fever does not exclude traumatic pericarditis. Respiratory rate is often elevated due to heart failure or direct lung involvement, and ruminal motility is usually reduced or absent. Because pericarditis typically results from traumatic reticuloperitonitis, tests for reticular foreign bodies are positive in 85% of affected cows (Braun U. et al., 2007).

The blood findings in cases of heart disease are non-specific. In Angus cow hematological abnormalities were leukocytosis ( $17.31 \times 10^9/L$ , normal 4.9–12) with neutrophilia ( $9.42 \times 10^9/L$ , normal 1.8–6.3), lymphocytopenia ( $0.41 \times 10^9/L$ , normal 1.6–5.6) and normocytic hypochromic anemia (RBCs  $3.50 \times 10^{12}/L$ , normal 5.1–7.6  $\times 10^{12}/L$ ; Hgb 6.5 g/dL, normal 8.5–12.2; HCT 35.9 %, normal 22–33). Albumin (1.8 g/dL, normal 3.03–3.55) and urea nitrogen (15 mg/dL, normal

20–30) from serum had values below the lower physiological limit, indicating hepatic insufficiency. Parameters such as ALT (89 IU/L, normal 11–40), AST (189 IU/L, normal 78–132), and GGT (175 IU/L, normal 15–39) were found in the serum in elevated levels, which are associated with possible hepatocellular damage and cholestasis. The total bilirubin level (0.8 mg/dL, normal 0.01–0.5) was increased associated with hepatocyte damage, cholestasis, and hemolytic anemia. The activities of GGT, AST and the serum concentration of bilirubin are increased, indicating hepatic congestion. An increase in the activities of liver enzymes, especially GGT, in cattle with right-sided cardiac insufficiency is usually a sign of liver congestion and not primary liver disease (Braun

U., 2009). Serum globulins (8.1 g/dL, normal 3–3.48) and total protein (10 g/dL, normal 6.74–7.46) had values that exceeded the upper physiological limit, indicating infection. The serum activities of glucose, phosphorus, calcium, sodium, and potassium were slightly decreased according to the parameters for the species (Kaneko, J.J. et al., 2008). Inflammatory processes and different degrees of renal, hepatic, and muscular damage can be detected. A case report of idiopathic pericarditis demonstrated a correlation between serum cardiac troponin I (cTnI) levels and the severity of the disease. A decrease in cTnI levels was also correlated with improvement of the cow (Jesty et al., 2005).



**Figure 1 a,b,c. Oedema of the abdominal region and briskeet and distension of the jugular veins in an Angus cow with traumatic reticuloperitonitis and pericarditis**

A sample of pericardial fluid may be aspirated from the pericardial sac. The smell, reminiscent of retained placenta and toxic metritis, is sufficiently diagnostic in cattle with traumatic pericarditis (Radostits et al., 2007). The technique is not without danger, however, as infection may spread to the pleural cavity.

Traumatic pericarditis can be diagnosed on radiography when a foreign body is seen perforating the cranial reticular wall and diaphragm, or is situated entirely cranial to the reticular wall. For an accurate location of a foreign body, a dorsoventral radiographic view would be necessary, but this is not possible in adult cattle because of the dorsoventral depth of the thorax (Braun U., 2009). Traumatic pericarditis cannot however be ruled out if a foreign body is not seen as thick radiodense adhesions may obscure a foreign body from view or the foreign body may have migrated back into the reticulum, where it may be seen lying freely in the organ or penetrating the reticular wall (Braun U., 2009). Thoracic radiographs are more helpful in small animals with heart disease to assess heart and vessel sizes and pulmonary oedema (Buchanan, 2000). Recently, radiographic measurement of the

caudal vena cava has been mentioned as a reliable tool for detecting heart disease in cattle because in cases of heart disease, the caudal vena cava had a decreased or absent pulsation index because of its severe distension (Jilintai et al., 2006).

The diffuse organisation of the Purkinje fibres in the bovine myocardium does not facilitate good ECG sensitivity (Reef and McGuirk, 2002). Consequently, the ECG cannot be used to detect enlargement of the cardiac chambers in cattle, although it is useful for differentiating physiological from pathological arrhythmias.

Ultrasonography is the method of choice for imaging and characterizing pericardial effusion. Cardiac ultrasonography has been described as a reliable tool to detect various types of heart disease. However, at this time, the usefulness of this non-invasive imaging process is limited to the diagnosis of heart disease and has no proven prognostic capabilities. Unlike in small animals or horses (Reef, 1995), echocardiographic measurements of ventricular septal defect sizes had no prognostic value in cattle (Buczinski et al., 2006). Prospective studies with the objective of finding prognostic parameters therefore still need to be performed in the bovine species. The

presence of large quantities of fibrin in the pericardium has been suggested as an important prognostic parameter in cases of pericarditis.

The Angus cow had a large amount of hypoechogenic pericardial fluid, and echogenic deposits and strands of fibrin on the epicardium. Strands of fibrin were seen floating in the fluid between the epicardium and pericardium. Ultrasonography of Angus cow abdomen revealed reticular changes typical of traumatic reticuloperitonitis, such as reduced motility and echogenic deposits.

Although neither radiography nor ultrasonography alone can achieve a complete definitive diagnosis of traumatic pericarditis, the two tools complement each other (Sharma MC, Kumar P., 2006).

As differential diagnosis in cattle with distension of the jugular veins and tachycardia, right-sided heart failure attributable to valvular endocarditis, cardiomyopathy, cardiac leucosis or other causes, must be considered (Grunder, 2002). Distension of the jugular veins without signs of right-sided cardiac insufficiency may be caused by obstruction or compression of the cranial vena cava by a thrombus or thoracic mass. Based on these poor results, under normal circumstances, cattle with traumatic pericarditis should be euthanized as quickly as possible. Treatment (pericardiocentesis and pericardial lavage, pericardiotomy associated with pericardial lavages, or pericardiostomy with fifth rib resection) should be attempted only in a valuable animal or in an animal carrying a high value embryo.

## CONCLUSIONS

Clinical examination alone do not allow a definitive diagnosis of pericarditis, because all of the typical signs, which include muffled heart sounds, tachycardia, pericardial sounds, oedema and distension of the jugular veins, may not be present in every case. In doubtful cases, ultrasonography of the heart and reticulum are indicated. In Angus cow with pericarditis and reticuloperitonitis the prognosis was poor, and pericardiocentesis or pericardiotomy were inadequate methods of treatment, thus euthanasia was indicated.

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