Extensive pleural abscess associated with congestive heart failure in a pregnant cow: unusual presentation of hardware disease

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SUMMARY

A four-year-old pregnant Friesian cow was referred to the Veterinary Teaching Hospital of Perugia University for right-sided congestive heart failure signs. Thoracic auscultation revealed decreased lung sounds and absence of heart sounds on the left side. On right site, increased breathing sounds and normal heart sounds were auscultated. Thoracic ultrasonographic examination allowed to visualize an extensive intrathoracic abscess displacing the heart against the thoracic wall with compression of the right atrium and ventricle. Congestive heart failure signs resolved after abscess drainage and the cow delivered a healthy bull-calf. Radiographic examination performed after delivery, showed a thoracic radiopaque foreign body cranial to the diaphragm. Due to worsening of the clinical health condition with subsequent poor prognosis, euthanasia was elected by the cow's owner. At the postmortem examination, a diffuse fibrinous pleuritis with a large abscess extending among thoracic wall, heart, and lung in the left thoracic cavity and containing a metal wire were observed. Multiple adhesions were present in both thoracic and abdominal cavities. This report describes clinical, radiographic and ultrasonographic, and postmortem findings in a cow affected by a traumatic pleural abscess and clinical signs of right-sided congestive heart failure. Pleural abscesses in cows, if particularly extensive, can cause cardiac displacement against the thoracic wall with right heart dysfunction leading to congestive heart failure.

KEY WORDS

Bovine; congestive heart failure; foreign body; ultrasonography.

INTRODUCTION

Traumatic reticoloperitonitis (TRP), or hardware disease, is a complex disease that occurs when foreign bodies, such as wires or nails, perforate the reticular wall and penetrate into the peritoneal cavity[1-3]. Thoracic cavity can also be involved in the inflammatory process if the foreign body perforates the diaphragm[4-5]. When foreign bodies penetrate the pericardial sac, pericardial effusion and cardiac tamponade can occur; this condition is commonly called traumatic pericarditis (TP). Tachycardia, distension/pulsation of the jugular veins, subcutaneous edema, and muffled heart sounds have been previously reported as common clinical signs of TP[6-8]. Severity of these clinical signs depends on the degree of cardiac tamponade[6-8]. Conversely, when foreign bodies cause pleuritis or thoracic abscesses, respiratory signs such as coughing, dyspnea, and abnormal lung sounds have been commonly reported[4-5].
In the present case report we describe an unusual presentation of TRP in a cow with a diffuse fibrinous pleuritis and a large pleural abscess associated with clinical signs of right-sided congestive heart failure (CHF).

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CASE PRESENTATION

A four-year-old Friesian cow in 9th month of gestation was referred to the Veterinary Teaching Hospital of Perugia University with severe edema of the submandibular region and brisket. Clinical examination showed poor body condition score (graded as 2/5), fasciculations of anconeus muscles, abduction of elbows and bilateral engorgement of the jugular veins (Figure 1).
The rectal temperature was 39.3° C and respiratory rate was 40 breaths/minute. The heart rate was 100 beats/minute with normal rhythm. Thoracic auscultation revealed decreased lung sounds over the middle third of the pulmonary fields and absence of heart sounds on the left side. Conversely, increased breathing sounds and normal heart sounds could be auscultated on right site. Hematological parameters revealed leukocytosis ($21.8 \times 10^3/\mu L$, reference range $6.0\text{-}17.0 \times 10^3/\mu L$) de-

Figure 1 - Edema of the submandibular region and brisket with distension of the jugular vein.

creased hemoglobin (9.7 g/dL, reference range 12.0-18.0 g/dL) and hematocrit (29.7 %, reference range 35.0-55.0 %). Serum chemistry profile showed increased hepatic enzymes (AST 340 U/L, reference range 50-150 U/L; ALKP 443 U/L, reference range 28-233 U/L) and decreased albumin (1.94 g/dL; reference range 2.5-3.5 g/dL). Ultrasonographic examination of the right thoracic cavity showed cardiac displacement against the right thoracic wall with compression of the right atrium and ventricle (Figure 2). Cardiac displacement was due to a well-defined, encapsulated mass occupying the left sided thoracic cavity. Ultrasonographic examination of the left thoracic cavity allowed to visualize this mass with hypoechoic fluid collection and multiple bright spots (Figure 2). The mass was 35 cm in diameter with a capsule of 3 cm thick. Being an extensive intrathoracic mass, its precise origin was unclear. Pleural effusion was also visualized. The ultrasonographic findings were typical of an intrathoracic abscess and clinical signs of right-sided CHF was considered secondary to compression of right atrium and ventricle against the thoracic wall.

A thoracic drainage tube was placed, and 25 liters of purulent exudate were drained. Echocardiographic examination was repeated after abscess drainage and showed normal dimension and function of the right atrium and ventricle. However, extensive pulmonary fields on the left-sided hemithorax were characterized by consolidation areas. Based on the antimicrobial susceptibility test from purulent exudate sample (*Trueperella pyogenes* was isolated), sulfadimethoxine and trimethoprim (Sulfaprim®, 10ml/100kg once a day EV) were administered. Although signs of CHF disappeared in 7 days, respiratory effort continued to be present and, after 14 days from admission, the cow delivered a healthy bull-calf weighing 28.5 kg. Three days following delivery, radiographic examination was performed and a thoracic radiopaque long, thin foreign body cranial to the diaphragm was identified (Figure 3).

Due to worsening of the clinical condition and poor prognosis, euthanasia was elected by the cow's owner. Seven days following delivery, the cow was euthanized in our hospital (after sedation, a euthanasia solution was intravenously administered) and submitted to necroscopy. A complete postmortem examination was performed. In the thoracic cavity, a diffuse bilateral fibrinopurulent pleuritis with moderate pleural effusion was evident. A large pleural abscess (about 20 cm in diameter, with 8 cm thick fibrous capsule) containing a metal wire of 7 cm was found in the left thoracic cavity (Figure 3). The abscess compressed the pulmonary parenchyma, without directly involving the lungs and showed multiple fibrous adherences with the surrounding tissues (lung and pericardium). Multiple adhesions were also present between pericardium and epicardium. Consolidation of the left lung with interlobular emphysema and tracheobronchial/mediastinal lymphadenomegaly were also present. Within the abdominal cavity, hepatomegaly and fibrinous adhesions between the diaphragm, liver, and spleen were present.

After the euthanasia of the dam, the calf was bottle-fed with milk replacer to an amount of approximately 10% of his body weight per day in 4 times during the first 3 weeks, then twice

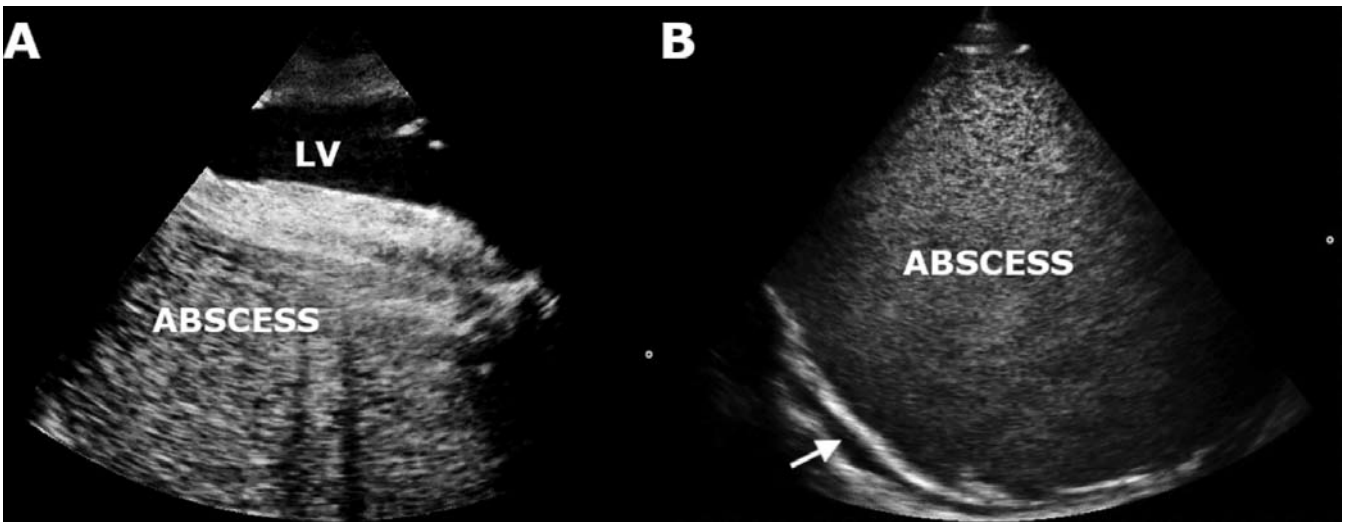

Figure 2 - Ultrasonographic images of the thoracic cavity from right (A) and left (B) parasternal view. (A) Only left ventricle (LV) can be visualized as the right ventricle is compressed against the thoracic wall by a mass (abscess). (B) This well-defined, encapsulated mass (abscess) is characterized by a hypoechoic fluid collection with multiple bright spots, extending for up to 35 cm from the chest wall into the left thoracic cavity. Pleural effusion was also visualized (arrow).

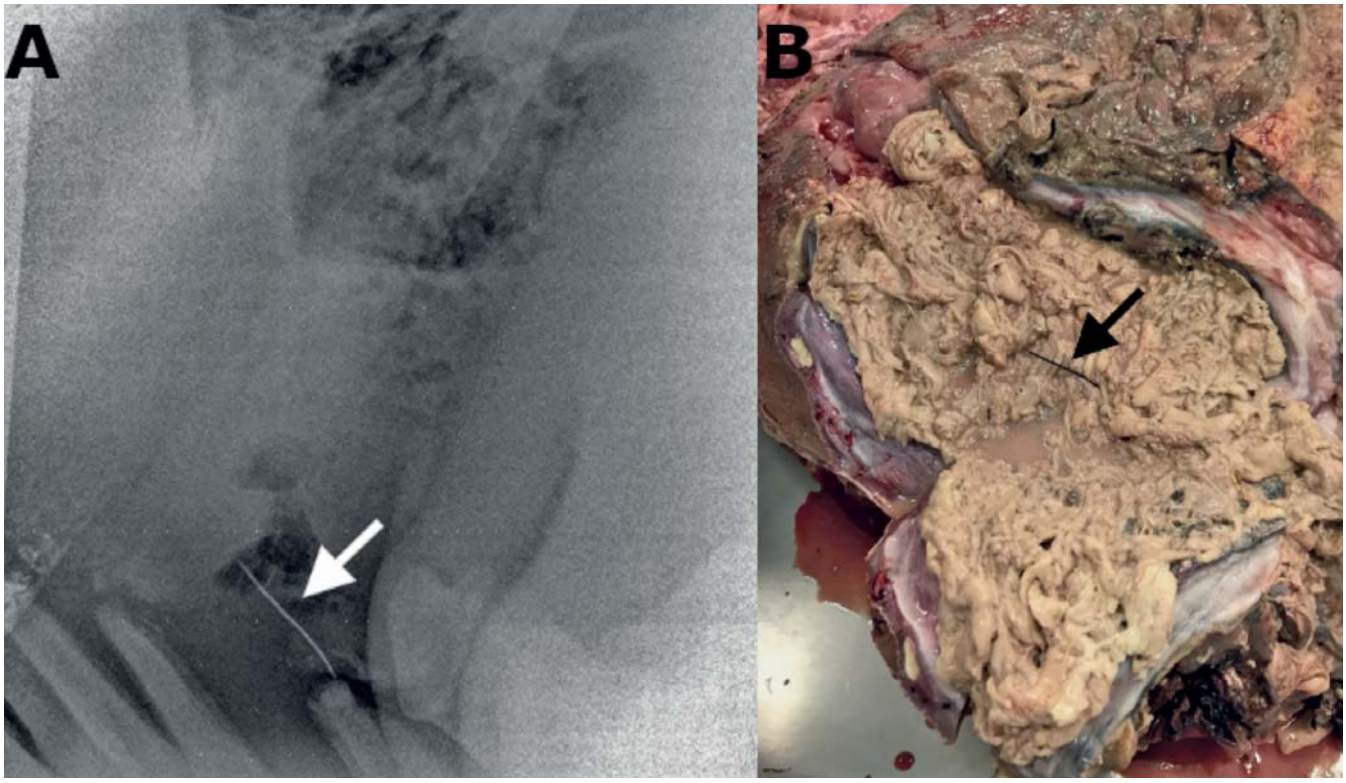

Figure 3 - Radiographic (A) and postmortem (B) images. (A) Laterolateral radiograph taken at the level of the diaphragm showing a thoracic radiopaque long, thin foreign body (white arrow) cranial to the diaphragm. (B) A large pleural abscess containing a metal wire of 7 cm long (black arrow) in the left-sided thoracic cavity.

a day until weaning. He was encouraged to eat concentrates as early as possible. Upon the 3 weeks, starter concentrate intake increased and the calf started growing significantly.

DISCUSSION

Clinical signs of right-sided CHF in cows are commonly due to TP, valvular endocarditis, idiopathic pericarditis, or cardiac tumors[6-11]. Traumatic pericarditis secondary to foreign body penetration through the reticulum is considered the main cause of right-sided CHF in cattle[6-8,12-14]. Perforation of the pericardium by a foreign body can cause pericarditis with fluid accumulation in the pericardial sac: if too much fluid builds up, it increases the intrapericardial pressure with subsequent cardiac compression and hemodynamic compromise[6-8,12-14]. Clinical signs depend on the degree of cardiac tamponade[6-8,12-14]. Tachycardia, distension/pulsation of the jugular veins, subcutaneous edema, muffled heart sounds, have been commonly reported in cows affected by TP[6-8,12-14]. In the cow described in this report, these clinical signs were present as a consequence of an extensive pleural abscess secondary to a foreign body migration, compressing the heart. The large abscess displaced the heart against the thoracic wall with compression of the right atrium and ventricle. This dramatically decreased right ventricular and atrial diastolic volume, increasing hydrostatic pressure in the cranial and caudal vena cava and causing distension/pulsation of the jugular veins, subcutaneous edema, and abdominal effusion.

Migration of the metallic foreign body from the reticular wall can be promoted by the pressure of the fetus in advanced gestation[14-16]. As in the cow of this report, the pregnant uterus can apply a physical pressure to the rumen and reticulum collaborating for penetration by an existing foreign body in the reticulum, mainly in the final third of the pregnancy, when the weight and size of the uterus are remarkably increased[17].

Echocardiography is a safe and noninvasive imaging technique that can be useful to confirm or rule out the presence of cardiac disease in cattle[18-20]. Moreover, this diagnostic tool is readily available and can be performed in veterinary hospitals as well as in farms. Echocardiography in animals with TRP has proven a good diagnostic procedure for distinguishing traumatic pericarditis from thoracic abscesses[7]. In the present case, echocardiography allowed to obtain the diagnosis of an intrathoracic abscess compressing right atrium and ventricle against the thoracic wall. Additionally, echocardiography showed the resolution of right atrial and ventricular compression with normal dimensions and function of the right-sided cardiac chambers after pleural abscess drainage, elicited by the disappearance of right-sided CHF clinical signs within 7 days.

Radiographic examination can be useful to visualize radiodense foreign bodies such as wire or nails. Laterolateral radiographic views of the caudoventral thorax and reticulum are commonly carried out with the cow in standing[1,7,21,22]. A dorsoventral radiographic view would also be required for accurate localization of the foreign body, however this is not possible in adult cattle due to the high dorsoventral depth of the thorax[7]. Frequently, the size of the cow cannot allow to obtain a conclusive radiograph with clear thoracic details. If a foreign body is not seen at the radiographic examination, its presence cannot be ruled out because thick radiodense adhesions can obscure the foreign body. Furthermore, the foreign body could be migrated back into the reticulum. Thoracic radiographic findings can be suggestive, but not conclusive for TP or pleural effusion/abscess, due to indistinguishable diaphragmatic outline

and cardiopulmonary silhouette. In the cow of this report, laterolateral radiograph performed after the drainage of the intrathoracic abscess, showed a thoracic radiopaque long, thin foreign body cranial to the diaphragm into the caudal mediastinum.

The prognosis in cows affected by TRP depends on the severity and chronicity of the disease: medical or surgical management in cases that are treated early shows a good to guarded prognosis[8,12,23]; TRP with diffuse peritonitis or chronic conditions have a poor prognosis[8,12,24]. In our case report, humane euthanasia was elected by the cow's owner because of severity and chronicity of the disease.

In conclusion, we have reported clinical, radiographic and ultrasonographic, and postmortem findings in a cow with a traumatic pleural abscess associated with clinical signs of right-sided CHF. Pleural abscesses in cows, if particularly extensive, can cause cardiac displacement against the thoracic wall with right heart dysfunction leading to CHF.

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Conflict of Interest

The authors declare that there were no conflicts of interest.

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