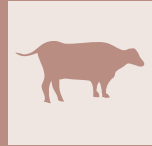


Traumatic reticulopericarditis in cattle: a retrospective case series



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SUMMARY

Traumatic reticulopericarditis is a significant complication in cattle due to foreign body ingestion, which can penetrate the reticulum and pericardial sac, leading to inflammatory fluid accumulation. Due to the importance of this disease for animal health and production, this study aimed to describe the clinical, laboratory, and postmortem findings in cattle diagnosed with traumatic reticulopericarditis. Ten cattle were included based on postmortem confirmation of the condition. When available, the collected data included gender, age, period of evolution of signs until care, clinical signs, outcome, blood profile, serum biochemistry, cavity effusion analysis, thoracic and/or abdominal ultrasound, and postmortem findings. The disease predominantly affected pregnant females in the final trimester. The main clinical manifestations were tachycardia, muffled heart sounds, dehydration, and recumbency. The primary laboratory findings included leukocytosis with neutrophilia, increased levels of the enzymes aspartate aminotransferase (AST) and creatine kinase (CK), hyperglobulinemia, hypoalbuminemia, hyperproteinemia, and a predominance of neutrophils in the cytological analysis of cavity effusions. Ultrasound proved to be a useful tool for detecting free fluid with fibrin in the thoracic and/or abdominal cavity. In this study, all animals died, and the definitive diagnosis was confirmed through postmortem examination. The prognosis is unfavorable, underscoring the importance of preventive measures to mitigate its impact on cattle well-being and production.

KEY WORDS

Diagnosis; foreign body; pericarditis; reticulum; ruminants.

INTRODUCTION

Traumatic reticulopericarditis is one of the primary disorders affecting ruminants, causing significant economic losses and mortality [1]. This disease is particularly prevalent in developing countries and small herds, where inadequate management and feeding practices are more common [2]. The ingestion of foreign bodies, particularly long, thin, and sharp objects, can lead to penetration of the reticulum, peritoneum, diaphragm, and pericardial sac, resulting in traumatic pericarditis [3].

Ruminants are particularly susceptible to this condition due to their lack of oral discernment and feeding habits, which prevent the detection of metallic objects and often do not thoroughly chew feed mixtures [4,5]. This behavior facilitates the ingestion of foreign bodies, which become lodged in the reticular mucosa [2]. Reticular contractions facilitate the perforation of the reticular wall by ingested objects, which may damage adjacent structures and lead to the extravasation of ingesta and bacteria into the peritoneal or thoracic cavity, triggering an inflammatory response [2,6-8].

The foreign bodies can penetrate the pericardial sac, leading to

the accumulation of serous or fibrinous inflammatory fluid, which can consequently trigger toxemia and progressive cardiac dysfunction, typically fatal in most cases [7,9]. A study of 60 cattle with fatal traumatic reticulitis reported traumatic pericarditis as a major complication in 40 cases [10].

The first clinical sign observed in this condition is tachycardia, although it is not exclusive to traumatic reticulopericarditis and can also be observed in various physiological or pathological states [11]. Other common signs include muffled heart sounds, submandibular and brisket oedema, and distension of the jugular veins [8]. However, many animals do not exhibit these signs, making the condition difficult to diagnose in its early stages [11]. The diagnosis is confirmed through various diagnostic tools, such as electrocardiography, ultrasound [12], echocardiography, and radiography of the thorax [3]. Postmortem examination also reveals characteristic lesions that confirm the presence of traumatic reticulopericarditis [9].

Given the unfavorable prognosis of traumatic reticulopericarditis, which leads to substantial economic losses and mortality [12,13], it is crucial to further investigate the disease. Therefore, this study aims to describe the main clinical, laboratory, and postmortem findings in cattle diagnosed with traumatic reticulopericarditis, contributing to a more effective approach to managing the disease in cattle.

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CASE PRESENTATIONS

In this study, ten cattle were included based on confirmation of the postmortem diagnosis of traumatic reticulopericarditis. Among the cattle, 80% (8/10) were female and 20% (2/10) were male. Of the females, 50% (4/8) were in the last third of gestation. The animals' ages ranged from one to nine years. Regarding housing and feeding practices, 60% (6/10) of the cattle were kept exclusively on pasture, while 40% (4/10) were kept on pasture and in barns, receiving supplementary feed as part of their diet. The duration of disease progression on the property, from the initial signs to arrival at the veterinary hospital, ranged from one to 30 days (mean = 11 days). The hospitalization period varied from one to four days (mean = two days). Lethality was 100% (Table 1).

Clinical signs

Regarding the animals' history, it was reported that 60% (6/10) had experienced anorexia for an average of eight days, while 40% (4/10) showed apathy for approximately 12 days. The observed clinical signs are summarized in Table 1.

Laboratory findings

Blood profile analysis performed on nine animals revealed that leukocytosis and neutrophilia were the main alterations observed in this study (Table 2). Serum biochemistry was conducted in five cases, with the main findings including elevated activity of aspartate aminotransferase (AST) in 60% (3/5), creatine kinase (CK) in 60% (3/5), hyperproteinemia in 60% (3/5), hypoalbuminemia in 60% (3/5), and hyperglobulinemia in 60% (3/5) (Table 2).

Cavitary effusions analysis was performed by collecting free peritoneal or pleural fluid from five animals. The fluid exhibited a yellowish color, a slightly cloudy appearance, and a predomi-

nance of neutrophils in cytology in 60% (3/5) of the samples.

Ultrasound

Ultrasound was performed in 40% (4/10) of the animals. In 75% (3/4) of the cases, the presence of free fluid with fibrin was observed in the thoracic and/or abdominal cavity (Figure 1), and in 50% (2/4), lung displacement and compression were noted.

Postmortem findings

All animals in the present study died. In 50% (5/10) of the cases, euthanasia was performed due to the animals' general condition and poor prognosis. Necropsy was performed in all cases, revealing that 40% (4/10) had fluid with fibrin in the thoracic cavity, and 30% (3/10) had it in the abdominal cavity. In 90% (9/10) of the cases, foreign bodies were found perforating the diaphragm, cardiac musculature, and/or reticulum (Figure 2). Additionally, all animals exhibited pericarditis (Figure 2), and 40% (4/10) showed hepatic congestion.

DISCUSSION

The ingestion of a foreign body by cattle can lead to various conditions based on the site of perforation. Initially, the foreign bodies may remain in the reticulum, causing mucosal damage and resulting in traumatic reticulitis [15]. As reticular contractions occur, the foreign bodies can perforate the reticular wall and reach the peritoneum, leading to traumatic reticuloperitonitis [4]. The ingested objects can also migrate and damage the pericardial sac, triggering traumatic reticulopericarditis [7].

Traumatic reticulopericarditis is one of the leading causes of death in cattle and buffalo due to the ingestion of foreign bodies [16]. This condition is of significant clinical importance in ru-

Table 1 - General information and clinical signs of the cattle affected by traumatic reticulopericarditis.

Case	Gender	Age (years)	Period of evolution of signs until care (days)	Clinical signs
1	F ^a	3	2	Apathy, tachycardia, muffled heart sounds, distension of the jugular veins, submandibular/brisket oedema, abdominal breathing, bruxism, elbows abducted, and ruminal hypomotility
2	F	3	4	Pale mucous membranes, tachycardia, muffled heart sounds, distension of the jugular veins, submandibular/brisket oedema, and ruminal hypomotility
3	M ^b	1	4	Dehydration, congested mucous membranes, tachycardia, muffled heart sounds, and ruminal atony
4	M	2	25	Dehydration, pale mucous membranes, tachycardia, muffled heart sounds, submandibular/brisket oedema, and ruminal atony
5	F	9	13	Recumbency, dehydration, apathy, pale mucous membranes, tachycardia, and ruminal atony
6	F	6	30	Recumbency, dehydration, pale mucous membranes, tachycardia, and ruminal hypomotility
7	F	2	15	Recumbency, dehydration, tachycardia, muffled heart sounds, elbows abducted, and ruminal hypomotility
8	F	6	1	Recumbency, dehydration, congested mucous membranes, and ruminal atony
9	F	2	6	Recumbency, pale mucous membranes, tachycardia, muffled heart sounds, submandibular/brisket oedema, elbows abducted, and ruminal atony
10	F	2	12	Recumbency, dehydration, congested mucous membranes, and ruminal hypomotility

^aFemale, ^bMale

Table 2 - Clinical pathology findings in cattle diagnosed with traumatic reticulopericarditis.

Parameters	Cases										Reference
	1	2	3	4	5	6	7	8	9	10	
Hematology											
Globular volume (%)	31	23	47	28	16	30	NP	38	20	26	24-46 ^b
Red blood cells (10 ⁶ /μL)	5.5	NP ^a	11.1	NP	2.3	5.1	NP	6.4	4.6	4.6	5-10 ^b
Hemoglobin (g/dL)	10.6	NP	15.9	NP	5.4	9.6	NP	12	7.1	9	8-15 ^b
Fibrinogen (mg/dL)	1000	400	1400	400	600	600	NP	200	400	1600	300-700 ^b
White Blood Cells (/μL)	12,900	28,350	18,000	13,900	26,500	12,300	NP	18,900	12,100	17,400	4000-12,000 ^b
Neutrophils (/μL)	5400	23,250	11,300	8200	19,300	10,100	NP	12,900	9900	10,800	600-4000 ^b
Lymphocytes (/μL)	7000	3700	5100	4300	6700	1900	NP	4900	2000	6600	2500-7500 ^b
Monocytes (/μL)	400	1400	1600	1400	-	300	NP	900	200	-	0-800 ^c
Eosinophils (/μL)	100	-	-	-	500	-	NP	200	-	-	0-900 ^c
Biochemistry											
AST (IU/L)	NP	180	184.9	NP	NP	NP	NP	328	NP	NP	78-132 ^c
GGT (IU/L)	NP	74.2	12.6	NP	NP	NP	NP	22.6	NP	NP	15-39 ^c
Total protein (g/dL)	NP	7.9	7.8	NP	7.6	NP	NP	5.8	6.1	NP	6.7-7.46 ^c
Albumin (g/dL)	NP	2.3	3.4	NP	3.4	NP	NP	2.5	2.7	NP	3.0-3.55 ^c
Globulin (g/dL)	NP	5.6	4.4	NP	4.2	NP	NP	3.3	3.4	NP	3.0-3.48 ^c
CK (IU/L)	NP	1163	2242	NP	NP	NP	NP	2666	NP	NP	44-211 ^c

^aNot performed, ^bKramer [14], ^cSmith [15].

minants, underscoring the need for a thorough analysis of the topic.

The age range of the animals in this study was similar to that observed in previous studies [1,17]. The incidence was higher in females, as reported by other authors in cattle [1,4,18] and buffaloes [11]. The predominance of cows, particularly in the final third of gestation, has been previously documented in both species [3,4]. This association may be attributed to the combined weight and size of the pregnant uterus, which could contribute to the perforation of the reticulum by an existing foreign object.

The time from the onset of the disease to the clinical care of the evaluated animals ranged from one to 30 days, as previously described [18]. Additionally, the incidence of the disease is higher

in cattle raised on pasture and fed large quantities of chopped food, due to the potential for inadequate environmental management and agricultural mechanization [4].

The main clinical signs observed were similar to those reported in other studies on cattle and buffaloes [1,9,11,17]. Bovines with pericarditis exhibit variable signs depending on the severity of the disease and the extent of the lesions [3,18,19]. According to Attia [11], tachycardia is the primary clinical sign observed in cattle with traumatic pericarditis, and it was present in 80% of the animals in this study. The presence of pericardial effusion and fibrin in the pericardial sac can lead to muffled heart sounds, as observed in 60% of animals [9]. Other signs, such as apathy, ruminal hypomotility or atony, and dehydration, may also be present, as observed in some ca-

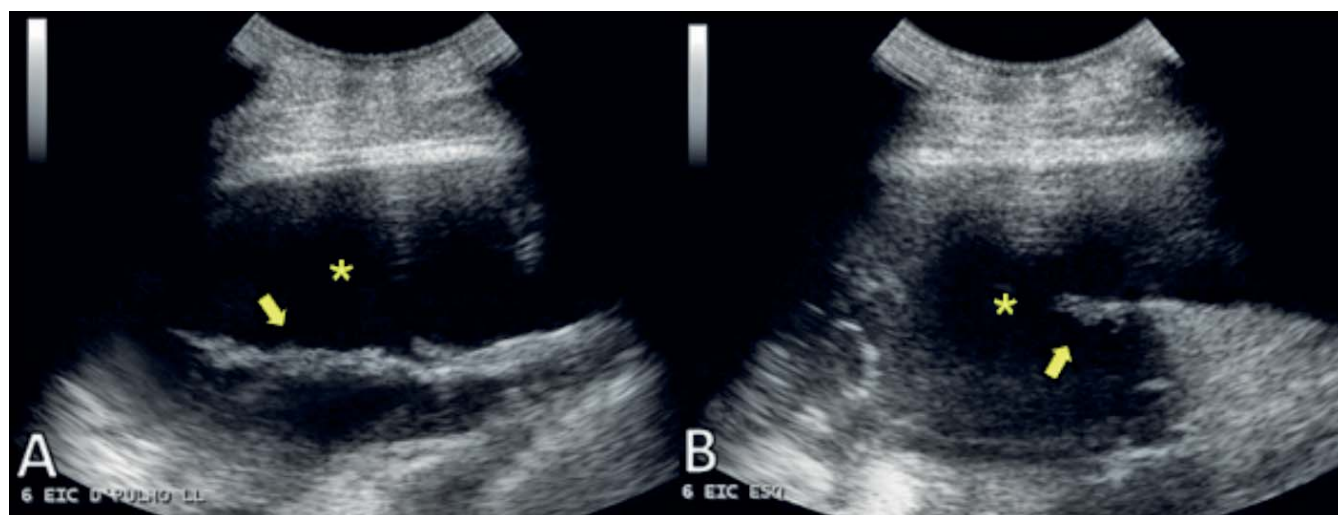


Figure 1 - Thoracic ultrasound. (A) Presence of free fluid (yellow asterisks) with fibrin (yellow arrows) in the right 6th intercostal space and (B) in the left.

ses in this study. However, these signs are common to many diseases in ruminants, and recumbency may be associated with long-term conditions. The absence of characteristic clinical signs does not rule out the diagnosis of traumatic reticulopericarditis, and additional tests are required for a definitive diagnosis.

The hematological findings in the present study revealed that all animals exhibited leukocytosis with neutrophilia, consistent with previous reports in both cattle and buffaloes [1,3]. Some authors have reported leukocytosis in the majority of cattle affected by traumatic reticulopericarditis [18,20]. These changes in the blood profile can be attributed to the inflammatory response triggered by the infectious process associated with the penetration of foreign bodies [11]. The main serum biochemistry results were similar to those reported in previous studies involving both cattle [1,9,18] and buffaloes [2,11]. Hyperproteinemia reflects the increase in globulins in plasma, resulting from the inflammatory response following the penetration of a foreign body [1,21]. Additionally, the increase in total protein may be asso-

ciated with dehydration. Hypoalbuminemia may be attributed to decreased hepatic synthesis, which prioritizes the production of positive acute phase proteins, as well as selective loss or sequestration into body spaces [22]. The increase in AST and CK enzymes' activity can be explained by damage to the skeletal and cardiac muscles. Furthermore, in cases of traumatic reticulopericarditis, it is common for cattle to develop right heart failure [23], and an increase in liver enzymes' activity associated with liver congestion may occur [9].

The cytological analysis of cavity effusions demonstrated the presence of inflammatory cells, with a predominance of neutrophils in most of the analyzed cases, consistent with previous findings in peritoneal fluid [24]. When penetrating the reticulum, the foreign body can damage several adjacent organs and allow their contents to leak into the cavities, resulting in inflammatory and infectious processes.

The presence of pleural fluid displacing the lungs and peritoneal fluid identified by ultrasound has also been observed in cattle and buffaloes previously [9,17,19]. In cases of trauma-

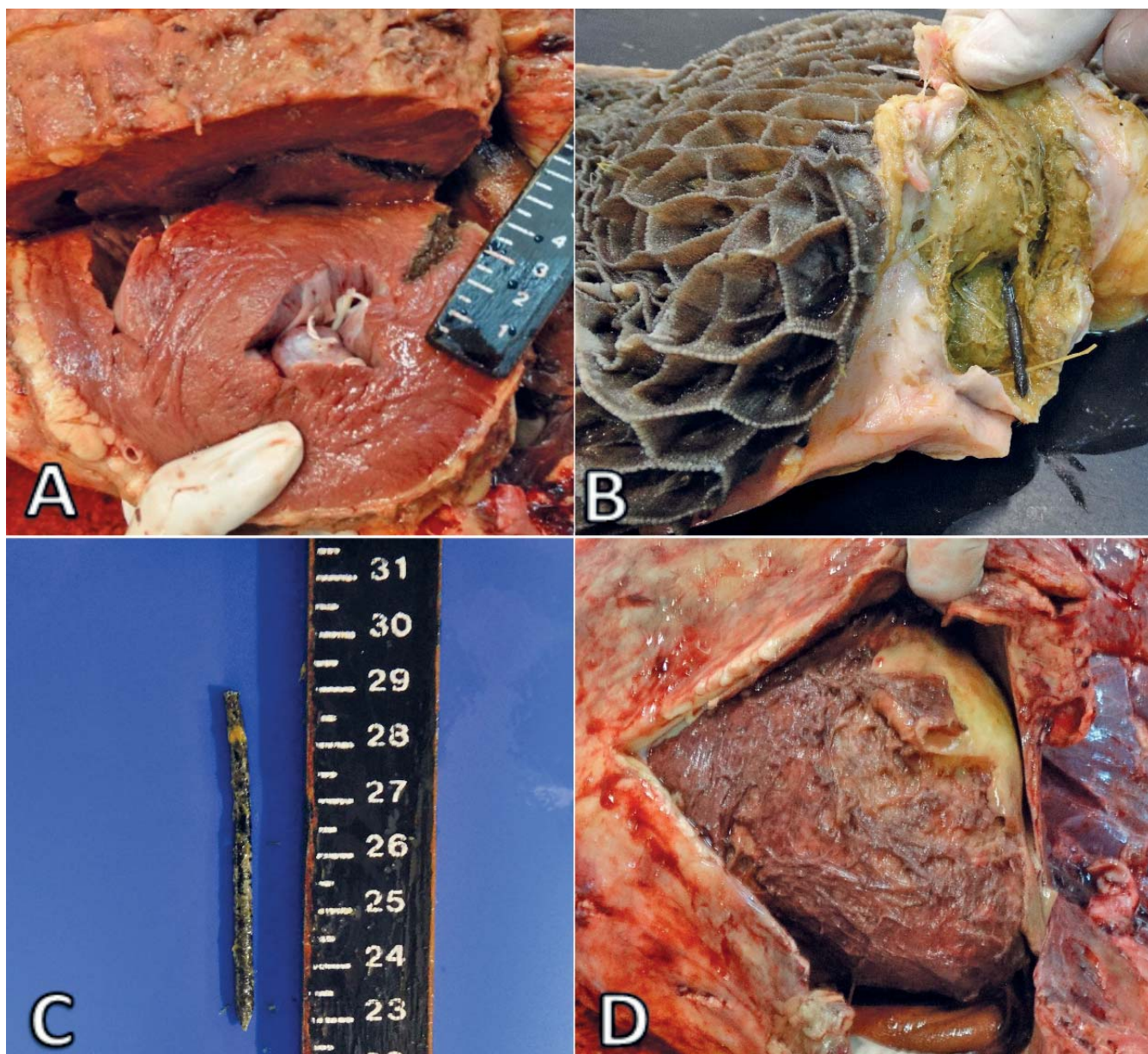


Figure 2 - Postmortem findings. (A) Perforation by a foreign body in the cardiac musculature, (B) in the reticulum. (C) Perforating foreign body. (D) Intense fibrin deposition in the pericardium.

tic reticulopericarditis, moderate to severe ascites is often seen due to heart failure [23]. Thoracic and abdominal ultrasound proved to be useful tools in assessing the extent of lesions in cattle.

All animals in the present study died, and the prognosis was considered unfavorable, consistent with several other studies [3,18]. The postmortem findings are in agreement with those previously reported [3,9,18]. Cavitory effusions with the presence of fibrin are frequently observed in postmortem examinations [7]. Foreign bodies are generally located during necropsy in the reticulum, diaphragm, heart, or thoracic cavity. However, they may not be found due to adhesions and the extent of the inflammatory process, as observed in one of the cases in this study [18]. The postmortem examination reveals characteristic lesions of reticulopericarditis, which play a key role in confirming the diagnosis of this disease in cattle.

The limitation of this retrospective case series is the lack of cardiac analysis using tools such as electrocardiograms and echocardiograms, as well as radiographs of the reticulum to detect foreign bodies, which could provide important parameters for evaluating animals affected by traumatic reticulopericarditis.

CONCLUSION

The main characteristics of cattle with traumatic reticulopericarditis include a higher incidence in females, particularly during the final third of gestation, and those raised on pasture. Clinical signs can vary, and the absence of typical signs does not rule out the diagnosis. Laboratory findings are characteristic, and ultrasonography is a useful tool for assessing the extent of lesions in the cavities. All animals in this study died, and the definitive diagnosis was established through postmortem examination. The prognosis is considered unfavorable, making the adoption of preventive measures essential to prevent the occurrence of the disease in cattle, given its significance in animal health and production.

Ethical Statement

This study was not submitted for ethics committee review because it is a retrospective analysis of medical records of the Large Animal Internal Medicine Service, Veterinary Teaching Hospital, School of Veterinary Medicine and Animal Science, São Paulo State University (UNESP) - Brazil.

Author Contributions

G.G.M. and S.B.C.: Conceptualization; G.G.M., L.V.O.F., and S.B.C.: Methodology and validation; R.K.T., N.S.R., W.A.B.P., J.P.O.F., A.S.B., R.M.A., and S.B.C.: Investigation and data curation; L.V.O.F. and G.G.M.: Writing-original draft preparation; R.M.A. and S.B.C.: Supervision. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare that there are no conflicts of interest.

Funding

This research received no external funding.

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