Case Report

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Hemangiosarcoma in the teat canal of a cow: case report

Hemangiossarcoma em canal do teto de uma vaca: relato de caso

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Abstract

Hemangiosarcoma is a neoplasm originating from the vascular endothelium, which can be located in various organs with a preference for those with higher vascularization, such as the spleen and liver. Granulomas in the lumen of the teat, milk stones, and fibropapillomas are responsible for partial or total stenosis of the teat; however, no cases of teat obstruction due to hemangiosarcoma have been reported. This study aimed to report the occurrence of hemangiosarcoma in the teat canal of a cow. The cow had a history of mastitis with blood and increased volume in the teat canal of the left anterior fourth mammary gland, which partially obstructed milk flow. This was confirmed by clinical examination. Blood count was performed, which revealed leukocytosis due to neutrophilia. The animal underwent telotomy, during which a nodular structure with a reddish color and hard consistency was removed and sent for histopathological evaluation, which revealed hemangiosarcoma. The animal showed good clinical evolution after the surgical procedure and was discharged five days later. The occurrence of hemangiosarcoma in cattle is considered rare, with a greater prevalence in dogs. To date, when diagnosed in cattle, none of these lesions has been found in the teat canal. Therefore, hemangiosarcoma must be included in the differential diagnosis when an increase in volume is observed in the teat canal, as despite its rare incidence in cattle, it can occur sporadically in tissues that do not have high vascularization.

Resumo

O hemangiossarcoma é uma neoplasia que tem origem no endotélio vascular, que pode estar situado em diversos órgãos, tendo preferência pelos órgãos que apresentam maior vascularização, como baço e fígado. Granulomas no lúmen do teto, cálculos de leite e fibropapiloma são responsáveis pela estenose parcial ou total do teto, porém ainda não foi relatado nenhum caso de obstrução de teto por hemangiossarcoma. Objetivou-se, neste trabalho, relatar a ocorrência de um hemangiossarcoma no canal do teto de uma vaca. A vaca tinha histórico de mastite com sangue e aumento de volume no canal do teto do quarto mamário anterior esquerdo, que obstruía parcialmente a saída do leite, o qual foi confirmado no exame clínico. Foi realizado hemograma que revelou leucocitose por neutrofilia. O animal foi submetido à telotomia, na qual foi retirada estrutura nodular de coloração avermelhada e consistência endurecida; essa estrutura foi encaminhada para avaliação histopatológica que evidenciou hemangiossarcoma. O animal apresentou boa evolução clínica após o procedimento cirúrgico, recebendo alta médica após cinco dias. A ocorrência do hemangiossarcoma em bovinos é considerada rara, sendo observada com maior prevalência em cães. Nenhuma dessas lesões diagnosticadas em bovinos foram encontradas no canal do teto. Desse modo, o hemangiossarcoma deve ser incluído no diagnóstico diferencial quando observado algum aumento de volume em canal do teto, pois, apesar de ser incomum e raro nos bovinos, notou-se que pode ocorrer de forma esporádica em tecidos que não apresentam alta vascularização.
Pavaras-chave: afecção mamária; bovinos; neoplasia mesenquimal; telotomia.

1 | Introduction

Hemangiosarcoma is a neoplasm originating from the vascular endothelium, which can be located in various organs, with a preference for those with higher vascularization, such as the spleen and liver. It is considered an extremely aggressive neoplasm that spreads easily through the hematogenous route, leading to metastases in various tissues (Martins et al., 2019).

The mammary gland receives a significant blood supply for milk production, and disorders of the mammary gland are limiting factors for milk production in dairy farms, potentially leading to the early culling of animals and milk as well as reduced production when the organ is affected by injury (Mariano et al., 2015).

Mastitis is the main mammary gland disease found in dairy farms, causing production losses of up to 20%. In addition to mastitis, teat conditions can be responsible for reduced milk production, which predisposes to the occurrence of mastitis or partial or complete stenosis of the teat canal (Nouh et al., 2014; Mariano et al., 2015).

Teat disorders are responsible for approximately 19.61% of mammary gland problems in cows and can be acquired or congenital, with acquired disorders being responsible for approximately 59.68% of cases and congenital disorders accounting for approximately 40.32 % of cases. Teat injuries represent most cases, due to their susceptibility to trauma from fences, crushing, and sharp objects in the milking line, and depending on the area of the teat affected, this can lead to partial or total stenosis of the teat (Nouh et al., 2014).

Granulomas in the teat lumen, milk stones, and fibropapillomas are responsible for partial or total teat stenosis, preventing the normal flow of milk. In addition, congenital obstructions can also be found, such as agenesis of the teat sphincter, congenital membranous obstruction, and an incompetent teat sphincter (Nouh et al., 2014).

Furthermore, viral infections can cause lesions on the skin of the cow's udder, especially on the teats, which favor secondary bacterial infections, leading to mastitis. Depending on the location and severity of the lesion, this can lead to partial or total obstruction of the teat, as is the case with pseudocowpox, vaccinia, and cowpox (Alonso et al., 2020; Silva et al., 2022).

Thus, several anomalies may be related to obstructions and partial or total stenoses in the teats of dairy cows; however, to date, no cases have been described where these obstructions were caused by hemangiosarcoma, with fibropapillomas being the most commonly found. Therefore, the aim of this study was to report the occurrence of hemangiosarcoma in the teat canal of a cow.

2 | Case description

A 3.5-year-old crossbred cow, with two calvings, not pregnant, weighing 450kg, raised in a semi-intensive production system, was attended at the Cattle Clinics of Garanhuns, Campus of the Federal Rural University of Pernambuco (CBG/UFRPE), vaccinated against clostridiosis, rabies, and foot-and-mouth disease, and wormed. The cow was fed corn silage and palm, and 8kg (two treatments per day) of mashed food containing soybean meal, corn bran, and cottonseed cake, in addition to receiving commercial mineral salt ad libitum. It was reported that around seven to eight months previously the cow had presented mastitis with blood, and was medicated with vitamin K and dexamethasone, without information about the volume and repetitions; there was no improvement in the condition, but since then the formation of a "lump" began in the teat canal and partially obstructed the milk flow. This was a single case in a group of nine animals.

2.1 | Clinical Examination

Detailed clinical examination of the animal was carried out according to Dirksen et al. (1993). On initial physical examination, the animal was calm, with a body condition score of III, temperature of 38.5°C, tachypnea of 48rpm, polypnea breathing, and an abdominal and noisy pattern, but without evidence of a specific pathological noise. The heart rate was measured at 84bpm, accompanied by bilateral cardiac hyperphonesis. Episcleral capillaries showed a slight injection. The animal exhibited a good appetite for grass tips, indicating a normal feeding behavior.

The rumen appears moderately full, with poorly defined strata, suggesting some degree of rumen activity, whereas tympany is absent, indicating no distension. Rumen dynamics consist of two complete

movements and one incomplete movement, reflecting typical rumen function.

Both the abomasum and intestine exhibit physiological peristalsis, demonstrating normal digestive activity. The feces were pasty, with a brownish-green color, indicating good digestion and sufficient quantity.

Upon evaluation of the mammary gland, it was found to be symmetrical and soft in consistency. In the teat canal of the left anterior fourth mammary (LAFM), there was a structure of firm consistency, measuring approximately 4×3cm and movable, which partially obstructed the flow of milk, with F blood (Fb) milk secretion, whereas in the other teats, milk secretion was normal (N) (Grunert, 1993).

2.2 | Laboratory results

To perform the blood count and determine the concentrations of total plasma protein and fibrinogen, 4mL of blood was collected in a Vacutainer® tube containing 10% K3EDTA (ethylene diamine tetraacetic acid) via venipuncture of the jugular vein using a 25×8mm needle. Samples were processed according to the method described by Harvey (2012). The blood count findings are presented in Table 1, highlighting leukocytosis due to neutrophilia.

Table 1. Hematological variables observed in a cow with partial teat obstruction treated at Cattle Clinics of Garanhuns, Campus of the Federal Rural University of Pernambuco (CBG/UFRPE)

Variables	Value	**Reference values***
Erythrocytes (x10⁶/µL)	5,0	5,0 - 10,0
Hematocrit (%)	27	24 - 46
Hemoglobin (g/dL)	8,3	8,0 - 15,0
MCV (fL)	54	40,0 - 60,0
MCHC (%)	30,74	30 - 36
Total leukocytes (/µL)	16.250	4.000 - 12.000
Lymphocytes (/µL)	5.525	2.000 - 7.500
Segmented neutrophils (/µL)	1.238	600 - 4.000
Band cells (/µL)	0	0 - 120
Eosinophils (/µL)	487	0 - 2.400
Monocytes (/µL)	0	25 - 840
Basophils (/µL)	0	0 - 200
TPP (g/dL)	8,2	7,0 - 8,5
PF (mg/dL)	600	300 - 700

MCV: means corpuscular volume; MCHC: means corpuscular hemoglobin concentration; TPP: total plasma proteins; PF: plasma fibrinogen. *According to Harvey (2012).

2.3 | Surgical procedure and additional treatment

Given the animal's clinical condition and the lesion identified during the physical examination, thoracotomy was performed as a therapeutic approach. Prior to the surgical procedure, the animal was intravenously administered Flunixin Meglumine (2.2mg/kg). To perform the surgical procedure, a wide trichotomy was initially performed around the teat of the LAFM, containment was performed in the right lateral decubitus position on a Gotze's trolley. Subsequently, antisepsis was performed with 2% chlorhexidine and iodinated alcohol in cruciform, before and after anesthesia, at the base of the left anterior teat with six mL of 2% lidocaine, followed by

application of a tourniquet at the base of the teat, and introduction of an intra-mammary metallic cannula (serving as a guide).

A longitudinal skin incision (3.5cm length) was then made, which was deepened until it reached the interior of the teat cistern. This made it possible to locate and remove the nodular structure, which had a reddish color and hardened consistency, with dimensions of approximately 2×3cm, and was mobile in the lumen of the teat, with a thin stalk resembling a vascular formation adhered to the mucosa of the teat canal (Figure 1). The procedure was continued with a Cushing-Lambert-type invaginating suture, involving the mucosa and muscles, with No. 1 polyglycolic acid thread, and the skin was sutured in a Wolf pattern with 0.40 Nylon thread, accompanied by topical application of dimethyl sulfoxide (DMSO) and spray based on oxytetracycline hydrochloride and hydrocortisone. A silicone intramammary probe was implanted via the teat sphincter (for milking purposes) and micropore dressing. The post-surgical therapeutic protocol consisted of four applications/SID of Flunixin Meglumine (2.2mg/kg/IV), systemic antibiotic coverage with Ceftiofur Hydrochloride (1mg/kg/IM/SID) for five consecutive days and intramammary/BID, based on Gentamicin Sulfate, for three consecutive days, treatment of the surgical wound daily, and manual milking twice a day. The animal responded well to surgical treatment and was discharged five days after the surgical procedure.

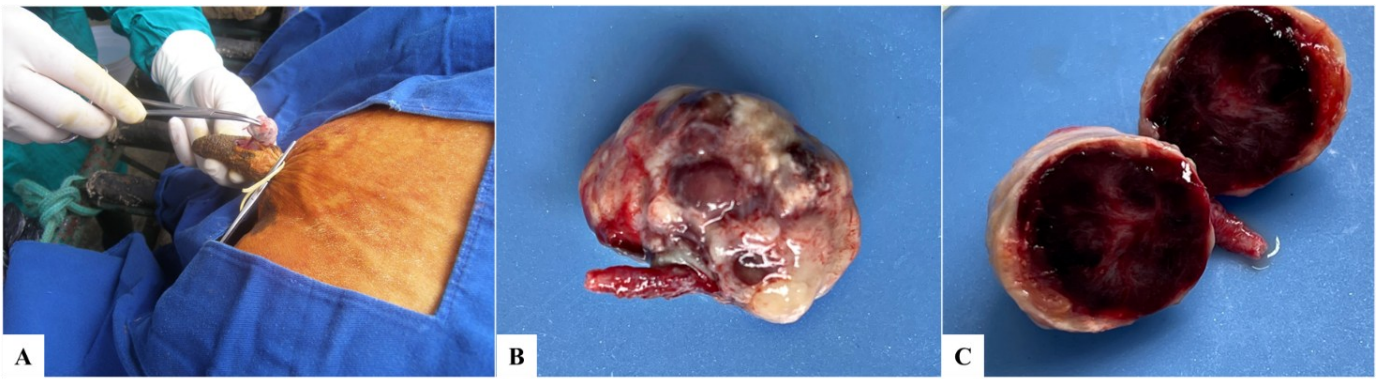

Figure 1. Hemangiosarcoma in the teat canal. (A) Surgical telotomy procedure to remove a nodule from the teat canal. (B) Reddish-white nodule with a multilobular and irregular surface. (C) Nodule, cut surface. Diffusely reddish, compact, smooth, and moist.

2.4 | Histopathological evaluation

The tissues obtained were fixed in 10% buffered formalin, routinely processed in the histopathology laboratory at CBG/UFRPE, and sent for histopathological evaluation at the Animal Pathology Laboratory of the Federal University of Campina Grande (Patos, PB).

The results showed a densely cellular, poorly delimited, non-encapsulated, and expansive neoformation, composed of malignant mesenchymal neoplastic cells, arranged in irregular, poorly delimited, and tortuous vascular spaces, supported by moderate fibrovascular stroma (Figure 2A). Spindle-shaped neoplastic cells with discretely eosinophilic cytoplasm and indistinct boundaries. Large nuclei, varying from oval to fusiform and marginalized, with coarsely dotted chromatin and inconspicuous nucleoli (Figure 2B). Scarce mitotic figures (0–1 per high-power field). Moderate pleomorphism characterized by moderate anisocytosis and marked anisokaryosis. Extensive areas of intratumoral hemorrhage were observed, sometimes associated with macrophages with cytoplasm containing erythrocytes (erythrophagocytosis) or distended by granular and brownish pigments (hemosiderophages) (Figure 2C). In the tumor periphery, there are also multifocal areas of mineralization and rare psammomatous bodies, leading to the diagnosis of hemangiosarcoma.

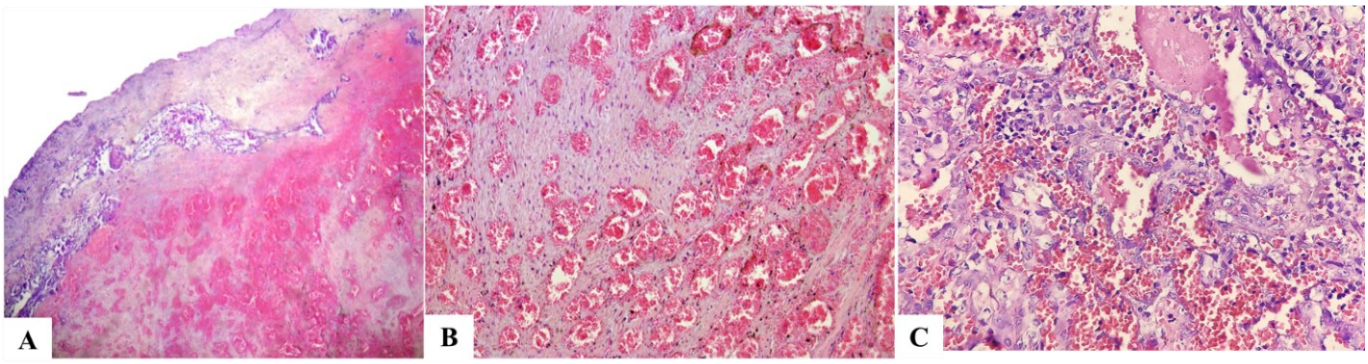

Figure 2. Hemangiosarcoma in the teat canal. (A) Densely cellular, poorly delimited and expansive neoformation. Hematoxylin–eosin (HE). Objective (obj). 10x. (B) Neoplastic cells arranging themselves in irregular vascular spaces filled with erythrocytes. HE. Obj. 20x. (C) Neoplastic cells showing moderate cellular pleomorphism, characterized by anisocytosis and anisokaryosis. HE. Obj. 40x.

3 | Discussion

The occurrence of hemangiosarcoma in cattle is considered rare, with a high prevalence in dogs (Sutton and McLennan, 1982; Pereira et al., 2018; Rezende and Brito, 2023). This condition represents only 1.3% of tumors diagnosed at the Federal University of Rio Grande do Sul in cattle (Reis et al., 2017), 1.38% of neoplastic diseases diagnosed at the Federal University of Campina Grande (Carvalho et al., 2016), and 1.5% of neoplastic lesions diagnosed at the Federal University of Santa Maria in animals from slaughterhouses (Tessele and Barros, 2016). However, none of the lesions diagnosed as hemangiosarcomas were found in the teat canal of cows.

There are few reports on the clinical course of hemangiosarcoma in cattle, as its clinical signs depend on the location of the tumor, which is most commonly observed in tissues with high vascularization, such as the spleen and liver (Sutton and McLennan, 1982; Stock et al., 2011; Tessele and Barros, 2016; Rezende and Brito, 2023). Contrary to what is described in the literature, in the present report, the only lesion found was in the teat canal, with no systemic signs observed that would lead us to suspect lesions in other organs.

Hemangiosarcoma is considered extremely aggressive and metastatic due to the dissemination of cancer cells through the hematogenous route, causing, in the most severe and disseminated cases, a condition of inappetence, a drop in milk production, and progressive weight loss, in addition to alterations that may be related to the location of the tumor, such as coughing in cases of lung involvement and hematuria in cases of urinary bladder involvement, as observed in cattle (Sutton and McLennan, 1982; Souto et al., 2006; Stock et al., 2011; Pereira et al., 2018; Rezende and Brito, 2023).

Unlike what is found in the literature, the animals in the present study were clinically healthy, eating satisfactorily, and had an adequate body score for age and productivity, only presenting hemogalactia and an increase in volume in the teat canal, which partially obstructed it. However, after surgery to remove the tumor, milk secretion returned to physiological levels and the animal did not show any systemic signs.

In the histopathological evaluation of hemangiosarcoma, it behaves similarly in all tissues where it occurs. In dogs, it is accompanied by evident nucleoli and multiple mitotic figures (Rezende and Brito, 2023), which are not found in cattle, with only none to two mitotic figures per higher magnification field (Souto et al., 2006; Pereira et al., 2018), as observed in the current study.

The other histopathological findings in the studied case are in accordance with those described in the literature for the most varied species, with spindle-shaped neoplastic cells with eosinophilic cytoplasm, coarsely dotted chromatin, marked anisocytosis and anisokaryosis, and formation of vascular channels filled with erythrocytes (Trivilin et al., 2008; Casagrande et al., 2009; Marietto-Gonçalves and Grandi, 2013; Carvalho et al., 2016; Rezende and Brito, 2023).

Animals affected by hemangiosarcoma, especially disseminated hemangiosarcoma, commonly present with anemia, both due to blood loss and functional alterations in the organs that participate in hematopoiesis. (Casagrande et al., 2009; Stock et al., 2011; Martins et al., 2019; Alves et

al., 2023), which was not observed in this study. Furthermore, one of the main hematological alterations found is leukocytosis due to neutrophilia, which is part of the main paraneoplastic syndromes of hemangiosarcoma found in dogs (Martins et al., 2019). This may have occurred in the present case or may have been just a reflection of the inflammation caused by the tumor inside the teat canal and in the mammary gland.

4 | Conclusion

The current case report shows that, although rare, hemangiosarcoma can occur sporadically in cattle and in tissues that do not have high vascularization. It should be included in the differential diagnosis when an increase in volume is observed in the teat canal. Furthermore, one must be aware of the possible systemic alterations that indicate metastatic involvement of the tumor due to the high malignancy of this neoplasm.

5 | Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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