

Hemoperitoneum in a Cow with Lumbar Muscle Hemangiosarcoma

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ABSTRACT

Background: Hemangiosarcoma is a malignant neoplasm of endothelial cells with an infiltrative growth pattern. Hemangiosarcomas are frequently reported in canines and rare in felines, sheep, goats, swine, horses and cattle. Few cases of hemangiosarcoma were reported in cattle. In the present report, we describe the clinicopathological findings of a bovine muscle hemangiosarcoma.

Case: A 6-year-old, Girolando cow from the Dairy Cattle Sector of the Federal Rural University of Rio de Janeiro (UFRRJ), Seropédica, presented sternal decubitus. Clinical signs were markedly pale mucous membranes, moderate dehydration, respiratory distress, and increased heart rate. The hematological examination revealed intense regenerative anemia. Due to the worsening of the clinical condition, the cow was submitted to euthanasia. The necropsy and collection of various fragments of organs were performed, which were sent to the “Setor de Anatomia Patológica” (SAP-UFRRJ). Tissues were fixed in 10 % buffered formalin, routinely processed for histology and stained with Hematoxylin and Eosin (HE). The external mucous membranes were markedly pale. Multifocal areas of 1.5 x 1.0 cm, irregular and dark red were observed dissecting the quadratus lumborum muscle (hemangiosarcoma) fibers. These neoplasms were associated with an extensive cruoric clot adhered to the muscle fibers. The extensive, red, friable mass measured approximately 76 x 55 x 20 cm on the serous surfaces of the organs of the peritoneal cavity (hemoperitoneum). The spleen was moderately reduced. The bone marrow was markedly pale. Histologically, it was observed that there was an extensive proliferation of endothelial cells in the quadratus lumbar muscle mass dissecting the epimysium and perimysium. Endothelial cells had moderate pleomorphism, organized in vascular channels and forming multifocally solid areas with a significant amount of eosinophilic fibrillar material (fibrin). Sections of muscle neoplasm were subjected to immunohistochemistry with anti-von Willebrand factor primary antibody, which showed a multifocal moderate cytoplasmic immunolabeling of neoplastic endothelial cells.

Discussion: There are few reports of striated muscle hemangiosarcoma in cattle. Muscular hemangiosarcomas were reported in a 4-month-old calf in the left cervical trapezius muscle and a 6-year-old Holstein cow with left pelvic limb mass lateral and distal to the knee. Some reports presented hemangiosarcoma in the iliopsoas muscle, left cervical trapezius muscle, pelvic limb muscles and right cervical muscle of the bovine. In the presented report, hemoperitoneum occurred as a result of hemorrhages from muscle hemangiosarcoma. Other studies have demonstrated cavity hemorrhages in joint, pelvic, pleural and cranial cavities associated with hemangiosarcoma. Hemangiosarcoma with regenerative anemia must be distinguished from other diseases that cause anemia. The main differential diagnoses of bovine with anemia are vena cava syndrome, coumarin derivatives poisoning, acute poisoning by *Pteridium* spp., tick fever, anaplasmosis, babesiosis and trypanosomiasis. Hemangiosarcoma should be differentiated from other lesions as hemangioma, vascular tumor of lymphatic endothelium and perivascular wall tumors. Cases with poorly differentiated morphology should be submitted for immunohistochemistry. In the present hemangiosarcoma case, we have used the von Willebrand factor for immunohistochemistry diagnosis. Expression of angiogenic growth factors such as CD31, vascular endothelial growth factor (VEGF), basic fibroblast growth factor (bFGF) and angiopoietin-1 (Ang-1) have also been used in the diagnosis of vascular proliferation lesions. Hemangiosarcoma in cattle should be included mainly in the differential diagnosis of diseases that cause acute anemia in cattle.

Keywords: cattle, neoplasia, hemangiosarcoma, hemoperitoneum, anemia.

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INTRODUCTION

Hemangiosarcoma is a malignant neoplasm of endothelial cells with an infiltrative growth pattern. Hemangiosarcoma often presents as a primary cutaneous form and less frequently visceral. The etiology of this neoplasm is unknown. However, studies indicate that frequent sun exposure predisposes its occurrence in the canine species [9]. Thus, the canine species have significant involvement and less frequency in felines, sheep, goats, swine, horses and cattle [2,6,8,10,13]. In Brazil, few cases of hemangiosarcoma were reported in cattle, only in surveys of lesions in slaughterhouses [18] or case series neoplasms studies [14]. There are no indications for treatments for hemangiosarcoma in production animals [17]. We report the clinicopathological findings of a skeletal muscle bovine hemangiosarcoma.

CASE

A 6-year-old Girolando cow from the Dairy Sector of the Federal Rural University of Rio de Janeiro (UFRRJ), from the municipality of Seropédica, was removed from the herd due to prostration. Clinical examination showed hypothermia, dehydration, severe anemia, markedly pale and dry mucous membranes, respiratory distress, tachypnea, and tachycardia. The hematological examination revealed severe regenerative anemia showing an acute hemorrhagic condition. Due to the clinical picture, the cow was submitted to euthanasia. The necropsy was performed, and the brain, lymph nodes and fragments of liver, spleen, lungs, kidney and quadratus lumbar muscle were collected, which were sent to the "Setor de Anatomia Patológica" (SAP-UFRRJ). These tissues were fixed in 10% buffered formalin, routinely processed for histopathology and stained with Hematoxylin and Eosin.

During the gross examination, it was observed that the oral, ocular and genital mucosa were markedly pale. There were multiple irregular multifocal areas, dark red with 1.5 x 1.0 interspersed with fibers (hemangiosarcoma) of the quadratus lumborum muscle. There was a mass (crural clot) measuring 76 x 55 x 20 cm, in its longest axes, attached to the quadratus lumbar muscle, in the right antimer, at the level of the fourth lumbar vertebra, caudally to the caudate process of the right lateral lobe of the liver, forming a large peduncle (hemoperitoneum). The clotted blood mass was markedly red, friable, smooth and moist (Figure 1) and was attached to the quadratus lumbar muscle

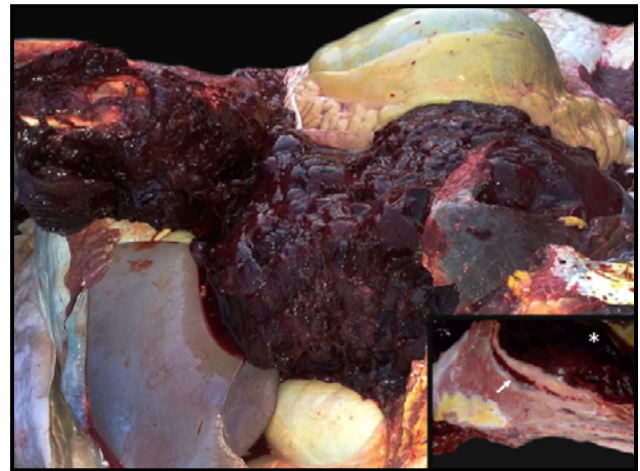


Figure 1. Hemoperitoneum is demonstrated by a blood clot covering an extensive area of the serosal surface of the abdominal viscera. The inset illustrates the hemangiosarcoma origin (arrow) in the quadratus lumbar muscle besides a blood clot (asterisk) interspersed with muscle fibers.

(Figure 1, inset). The spleen was moderately reduced, and the bone marrow markedly pale. The other organs did not show significant gross changes.

Histologic examination showed an extensive pleomorphic endothelial proliferation interspersed the epimysium and perimysium of the *quadratus lumborum* muscle. The endothelial cells had moderate pleomorphism, anisocytosis and anisocariosis, organized in vascular channels and forming multifocal solid areas (Figure 2A), sometimes with moderate fibrin. The extensive peritoneal mass adjacent to the hemangiosarcoma was histologically compatible with a crural clot containing a moderate amount of hemosiderophages.

Muscle neoplasm sections were submitted to immunohistochemistry with primary ready-to-use polyclonal anti-von Willebrand factor (Catalog. IR527)¹. Antigen retrieval was performed with citrate buffer (pH 6.1) for twenty minutes at 98°C in a water bath. The sections were set at 37°C for 2 hours with primary antibody. The positive control used was from a previously diagnosed hemangioma in a canine. The primary antibody was changed by phosphate-buffered saline (PBS) for negative controls. A streptavidin-biotin-peroxidase commercial kit was employed as the detection system, and the activity was visualized with EnVision FLEX HRP¹ followed by 3,3'-Diaminobenzidine tetrahydrochloride staining (DAB)¹. The sections were counterstained with Mayer's hematoxylin², cover-slipped, and then viewed with an optical microscope. The immunohistochemistry revealed moderate cytoplasmic immunolabeling in the neoplastic endothelial cells (Figure 2B)

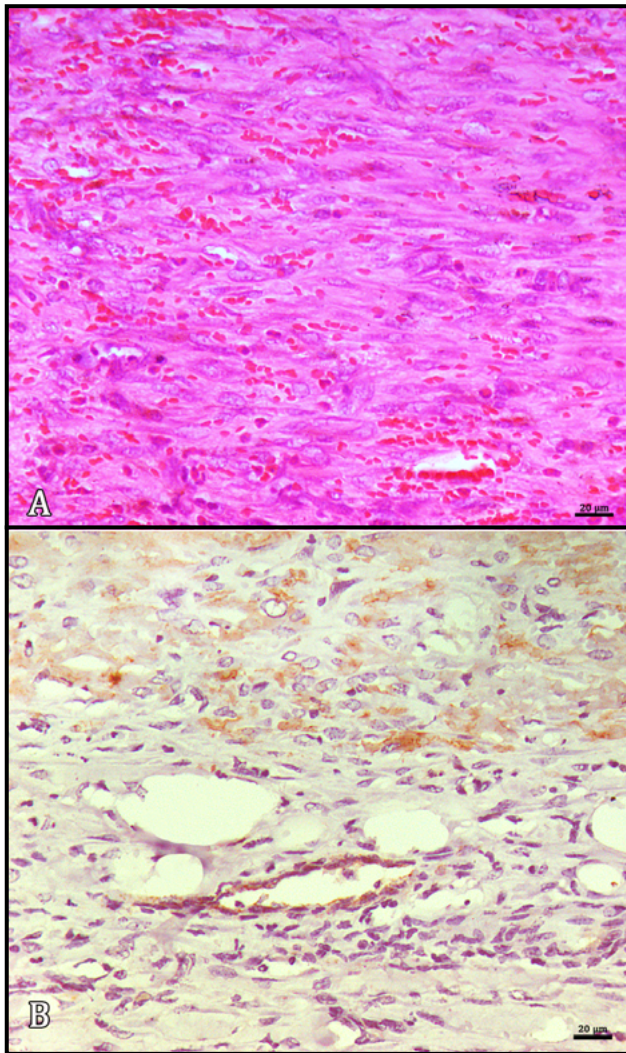


Figure 2. A- Pleomorphic endothelial cells forming thin vessel channels in the quadratus lumborum muscle. B- Immunolabeling against anti-von Willebrand Factor in neoplastic endothelial cells.

DISCUSSION

The diagnosis of primary quadratus lumbar muscle hemangiosarcoma was based on clinical, hematological, macroscopic, histological and immunohistochemical findings. Hemangiosarcoma in bovine skeletal muscle is uncommon. Muscular hemangiosarcoma was reported in a 4-month-old calf in the left cervical trapezius muscle [21] and a 6-year-old Holstein cow in the left pelvic limb muscles [20].

In bovine species, muscle hemangiosarcoma has been reported in iliopsoas muscle [19], left cervical trapezius muscle [21] and pelvic limb [22], and forelimb [8] muscles. To our knowledge, hemangiosarcoma and hemoperitoneum have not been reported in cattle. Other organs affected by hemangiosarcoma in cattle were the brain [8], lungs [17], liver [23], and kidney [17]. Primary spleen hemangiosarcoma with metastasis

to lungs and liver was diagnosed in a cow in the state of Rio de Janeiro [13].

The intense hemorrhage in the peritoneum was responsible for the anemia. Hemangiosarcomas have been associated with hemorrhages in other cavities as joint [9], pelvic [17,19,21,23], pleural [12,20] and cranial [8]. Hemoperitoneum in animals can be termed as spontaneous or traumatic. Based on the literature, spontaneous is related to neoplasia, coagulopathy and vena cava syndrome. The traumatic is related to trauma caused by accidents, such as being run over [5].

Incidence hemangiosarcoma is higher in canids, and therefore there is an abundance of clinical data in this species. A survey of the prevalence of anemic dogs with hemoperitoneum showed that 50/71 (70%) dogs examined had hemangiosarcoma concomitantly [9]. One study correlated the prevalence of hemoperitoneum and hemangiosarcoma in cats, in which 18/65 (27%) had hemoperitoneum caused by hemangiosarcoma [5].

Hemangiosarcoma should be differentiated from other lesions as hemangioma, vascular tumor of lymphatic endothelium and perivascular wall tumors. Cases with poorly differentiated morphology should be submitted for immunohistochemistry [15]. In the present hemangiosarcoma case, we have used the von Willebrand factor for immunohistochemistry diagnosis. Expression of angiogenic growth factors such as CD31, vascular endothelial growth factor (VEGF), basic fibroblast growth factor (bFGF) and angiopoietin-1 (Ang-1) have also been used in the diagnosis of vascular proliferation lesions [6,10,15].

Due to the friable consistency of hemangiosarcoma mass, it can rupture and cause hemorrhages by *rhesis*. In this context, blood loss is rapidly dynamic and leads to acute anemia, as in the presented clinical condition. This clinical picture must be differentiated, mainly, from the vena cava syndrome [12], poisoning by coumarin derivatives [1] and acute poisoning by *Pteridium* spp. [7]. However, slowly dynamic anemias such as tick fever [4], anaplasmosis [11], babesiosis [16] and trypanosomiasis [3] should also be included in the differential diagnosis. Hemangiosarcomas should be included in the list of diagnoses of causes of acute anemia in cattle.

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Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES

- 1 Brito M.F., Seixas J.N., Jabour F.F., Andrade G.B., Cunha B.R.M., França T.N. & Peixoto P.V. 2005. Sobre um surto de envenenamento por derivado cumarínico em bovinos. *Pesquisa Veterinária Brasileira*. 25(3): 143-149.
- 2 Caswell J.L. & Williams K.J. 2016. Respiratory System. In: Maxie M.G. (Ed). *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*. 6th edn. New York: Elsevier, pp.465-492.
- 3 Costa R.V.C., Abreu A.P.M., Thomé S.M.G., Massard C.L., Santos H.A., Ubiali D.G. & Brito M.F. 2020. Parasitological and clinical-pathological findings in twelve outbreaks of acute trypanosomiasis in dairy cattle in Rio de Janeiro state, Brazil. *Veterinary Parasitology: Regional Studies and Reports*. 22: 1-9.
- 4 Costa V.M.M., Rodrigues A.L., Medeiros J.M.A., Labruna M.B., Simões S.V.D. & Riet-Correa F. 2011. Tristeza parasitária bovina no Sertão da Paraíba. *Pesquisa Veterinária Brasileira*. 31(3): 239-243.
- 5 Culp W.T.N., Weisse C., Kellogg M.E., Gordon I.K., Clarke D.L., May L.R. & Drobatz K.J. 2010. Spontaneous hemoperitoneum in cats: 65 cases (1994-2006). *Scientific Reports*. 236(9): 978-982.
- 6 Flores M.M., Panziera W., Kommers G.D., Irigoyen L.F., Barros C.S.L. & Figuera R.A. 2012. Aspectos epidemiológicos e anatomopatológicos do hemangiossarcoma em cães: 40 casos (1965-2012). *Pesquisa Veterinária Brasileira*. 32(12): 1319-1328.
- 7 França T.N., Tokarnia C.H. & Peixoto P.V. 2002. Enfermidades determinadas pelo princípio radiomimético de *Pteridium aquilinum* (Polypodiaceae). *Pesquisa Veterinária Brasileira*. 22(3): 85-96.
- 8 Guard C. & Wilkinson J.E. 1984. Hemangiosarcoma in a cow. *Journal of the American Veterinary Medical Association*. 185(7): 789-790.
- 9 Hammond T.N. & Pesillo-Crosby. 2008. Prevalence of hemangiosarcoma in anemic dogs with a splenic mass and hemoperitoneum requiring a transfusion: 71 cases (2003-2005). *Journal of the American Veterinary Medical Association*. 232(4): 553-558.
- 10 Leitzen E., Stumpf S., Zimmermann C., Bienert-Zeit A., Hellige M., Baumgärtner W. & Puff C. 2020. A rare case of vascular proliferation in the mandible of a juvenile horse. *Frontiers in Veterinary Science*. 7: 1-5
- 11 Lima D.H.S., Vinhote W.M.S., Ubiali D.G., Soares P.C., Cordeiro M.D., Silva J.B., Fonseca A.H. & Barbosa J.D. 2019. Experimental infection by *Anaplasma marginale* in buffaloes and cattle: clinical, hematological, molecular and pathological aspects. *Pesquisa Veterinária Brasileira*. 39(9): 700-709.
- 12 Motta R.G., Motta I.G., Martinez A.C., Silva A.V., Paes A.C., Martins L.S.A., Silva R.C. & Ribeiro M.G. 2016. Unusual caudal vena cava thrombosis in a cow, secondary to *Trueperella* (*Arcanobacterium*) *pyogenes* infection. *Pesquisa Veterinária Brasileira*. 36(7): 587-590.
- 13 Pereira G.O., Carvalho N.S., Retamero P.D., Oliveira M.C., Lorenzo C., Brito M.F. & Ubiali D.G. 2018. Hemangiossarcoma metastático em uma vaca. *Acta Scientiae Veterinariae*. 46 (Suppl 1): 279. 5p.
- 14 Reis M.O., Slaviero M., Lorenzetti M.P., Cruz R.A.S., Guimarães L.L.B., Pavarini S.P., Driemeier D. & Sonne L. 2017. Neoplasmas bovinos diagnosticados no Setor de Patologia Veterinária da UFRGS, Porto Alegre (2005-2014). *Pesquisa Veterinária Brasileira*. 37(2): 105-109.
- 15 Robinson W.F. & Robinson N.A. 2016. Cardiovascular System. In: Maxie M.G. (Ed). *Jubb, Kennedy & Palmer's Pathology of Domestic Animals*. 6th edn. New York: Elsevier, pp.100-101.
- 16 Silva T.M., Areco W.V.C., Faccin T.C., Melo S.M.P., Figuera R.A. & Kommers G.D. 2018. Caracterização histológica no diagnóstico da babesiose bovina por *Babesia bovis*. *Pesquisa Veterinária Brasileira*. 38(4): 649-658.
- 17 Stock M.L., Smith B.I. & Engiles J.B. 2011. Disseminated hemangiosarcoma in a cow. *Canadian Veterinary Journal*. 52(4): 409-413.
- 18 Tessele B. & Barros C.S.L. 2016. Tumores em bovinos encontrados em abatedouros frigoríficos. *Pesquisa Veterinária Brasileira*. 36(3): 145-160.
- 19 Tucker D.W., Olsen D., Kraft S.L., Andrews G.A. & Gray A.P. 2000. Primary hemangiosarcoma of the iliopsoas muscle eliciting a peripheral neuropathy. *Journal of the American Animal Hospital Association*. 36(2): 163-167.

- 20 Urdaz J.H., Tyler J.W., Henry C.J., Gautz P., Turk J.R. & Turnquist S.E. 2001.** Primary cutaneous haemangiosarcoma in a cow. *Veterinary Record*. 149: 306-307.
- 21 Vermunt J.J. & Thompson K.G. 2001.** Haemangiosarcoma in a 4-month-old calf. *New Zealand Veterinary Journal*. 49: 120-121.
- 22 Vogel S.R., Desrochers A., Lanthier I., Strina M. & Babkine M. 2012.** Acute compartment syndrome in the pelvic limb of a cow following biopsy of a skeletal muscle-associated hemangiosarcoma. *Journal of the American Veterinary Medical Association*. 240(4): 454-458.
- 23 Warren A.L. & Summers B.A. 2007.** Epithelioid Variant of Hemangioma and Hemangiosarcoma in the Dog, Horse, and Cow. *Veterinary Pathology*. 44(1): 15-24.