







Spinal cord anaplastic meningioma with extra-neural metastasis in a cat

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ABSTRACT: *Meningiomas are the most frequent neoplasms involving the brain in dogs and cats, and are occasionally observed in the spinal cord. They cause compression of the central nervous system; however, do not infiltrate the neuropile and rarely metastasize to other organs. The present study describes a case of anaplastic spinal meningioma with extra neural metastasis in a 20 years-old cat. Clinically, the feline presented a clinical history of 120 days with paresis of the hind limbs and loss of the tail's movements, with subsequent death. At necropsy, there was an irregular and soft whitish mass involving the meninges from the lumbar intumescence to the sacral region of the spinal cord. Similar white nodular masses were observed in the lungs, liver and kidneys. Microscopically, both were composed of a poorly limited and infiltrative neoplastic proliferation composed by spindle, round and epithelioid cells, with a high cellular pleomorphism. On IHC, there was a severe immunostaining for vimentin and S100. Histopathologic and IHC analysis are important tools for definitive diagnosis of meningiomas in cats, and differentiation of other common neurologic disorders in these animals.*

Key words: ataxia, immunohistochemistry, spinal cord, meningioma, metastasis, central nervous system.

Meningioma anaplásico medular com metástases extra-neurais em um felino

RESUMO: *Meningiomas são neoplasias frequentes no encéfalo de cães e gatos e ocasionalmente observadas em medula espinhal. Causam, geralmente, compressão do sistema nervoso central, todavia não infiltram o neurópilo e raramente fazem metástases a outros órgãos. Este trabalho descreve um caso de meningioma anaplásico espinhal com metástases extra-neurais em um felino de 20 anos de idade. Clinicamente, o felino apresentou um quadro de paresia dos membros pélvicos e perda dos movimentos da cauda com evolução de 120 dias, vindo a óbito. À necropsia, apresentava massa irregular, macia e brancacenta envolvendo as meninges da intumescência lombar à região sacral da medula espinhal. Áreas nodulares esbranquiçadas similares foram observadas nos pulmões, fígado e rins. Histologicamente, ambas consistiam em proliferação neoplásica não delimitada e infiltrativa de células fusiformes, arredondadas a epitelioides, com um alto pleomorfismo celular. À IHQ, exibiam acentuada marcação para vimentina e S100. As análises histopatológica e IHQ são importantes ferramentas para obter-se o diagnóstico definitivo de meningiomas em felinos, e permitem diferenciar a condição de outras afecções neurológicas comuns nesses animais.*

Palavras-chave: ataxia, imuno-histoquímica, medula espinhal, meningioma, metástase, sistema nervoso central.

INTRODUCTION

Meningiomas are the most common primary neoplasms affecting the central nervous system of dogs and cats (HIGGINS et al., 2017). This neoplasm originates from the meninges and it presents a compressive rather than an infiltrative behavior, forming round nodular masses (HIGGINS et al., 2017). Meningiomas are divided in subtypes, according to morphological characteristics of the cells (HIGGINS, et al., 2017), and may cause a wide range of clinical signs (MARCASSO et al., 2015). Metastasis are, however, uncommon (MOTTA et al., 2012), and mainly related to a primary brain involvement in dogs (SCHULMAN et al., 1992; MARCASSO et al.,

2015). The aim of this study is to describe the clinical, pathological and immunohistochemical (IHC) features of a case of anaplastic spinal meningioma with extra neural metastasis in a 20 years-old cat.

A 20-year-old, female, mixed-breed cat, that was negative for antibodies of feline immunodeficiency virus (FIV) and for antigens of feline leukemia virus (FeLV) at the SNAP FIV/FeLV Combo (Idexx Laboratories), had a three-month history of weight loss and right hind limb (RHL) paralysis, which evolved to a left hind limb (LHL) incoordination, urinary incontinence, dyschezia and constipation at the last 30 days. On physical examination, marked cachexia, LHL ataxia, proprioception loss of the RHL, decreased patellar reflexes and loss of tail movements

were observed. Supportive and pain management treatments were employed. After six days, the cat clinical condition worsened, resulting in death.

At the necropsy, the cat presented a marked cachexia and a severe atrophy of the hind limbs skeletal muscles. A whitish multinodular irregular soft mass involving the meninges and compressing the spinal cord from the lumbar intumescence to the sacral region was observed. It measured 4.4cm x 1.2cm x 0.6cm, and on cut surface it expanded into the spinal cord (Figure 1A). The lungs, urinary bladder and kidney showed pinpoint to nodular multifocal to coalescing whitish firm masses, ranging from 0.2cm to 0.5cm in diameter (Figure 1B). Multiple samples of organs were collected, fixed in 10% neutral buffered formalin, routinely processed for histology and stained with hematoxylin and eosin (HE). Cut sections of the masses involving the spinal cord and the lungs were submitted to IHC exam with the following antibodies, according to previously described protocols (PEREIRA et al., 2017): vimentin (clone V9; 1:200; Zymed), cytokeratin (clone AE1/AE3; 1:80; DakoCytomation), S100 (1:200; DakoCytomation) and glial fibrillary acidic protein (GFAP; 1:500; DakoCytomation). Reactions were revealed with 3,3'-diaminobenzidine chromogen (DAB; DakoCytomation) and counterstained with Harry's hematoxylin.

Histological examination of the spinal cord revealed a poorly limited and infiltrative neoplastic proliferation composed of a highly cellular population supported by a sparse fibrovascular stroma. The neoplasm compressed and extended into the white and grey matters, in addition to nerves roots (Figure 1C). Cells were spindle, arranged in bundles in multiple directions, to round and epithelioid, arranged in cohesive nests (Figure 1D). There were marked anisocytosis and anisokaryosis, with a medium of seven mitotic figures per high-power field (400x). Multifocal areas of intratumoral necrosis and mild dystrophic mineralization were also observed. Adjacent to the neoplasm, there was a moderate multifocal perivascular inflammatory infiltrate composed of lymphocytes and plasma cells, in addition to moderate multifocal Wallerian degeneration. The lung parenchyma exhibited in the alveolar spaces a poorly limited neoplastic proliferation composed by round and epithelioid cells similar to those described in the spinal cord with rare spindle cells (Figure 1E). These neoplastic cells were also observed in the cortex of the kidneys and in the mucosa of the urinary bladder. At the IHC, the neoplastic cells presented a marked

and diffuse intracytoplasmic immunostaining for vimentin (Figure 1F), while there was a moderate multifocal intranuclear and intracytoplasmic immunostaining for S100. Immunostaining was negative for cytokeratin and GFAP.

The diagnosis of anaplastic meningioma involving the spinal cord with extra neural metastasis of the present study was obtained through the clinical, histopathological and IHC findings. Although meningiomas are commonly detected in the brain of dogs and cats (HIGGINS et al., 2017), the spinal cord location is sporadically described in cats (MARIONI-HENRY, 2010). Meningiomas usually occur in cats over 9 years-old and their prevalence tends to increase with age (HIGGINS et al., 2017), as in the present report, and, when affecting the spinal cord, they have been reported involving mainly the thoracic (SUMNER et al., 2007) and occasionally the cervical and lumbar segments (MARIONI-HENRY, 2010; MARCASSO et al., 2015). However, the infiltrative and metastatic behavior of the neoplasm observed in the present report differs from previous studies in cats, in which meningiomas were solely composed of compressive masses (LU et al., 2003; MOTTA et al., 2012; HIGGINS et al., 2017).

The cat of the present study showed characteristic clinical signs of spinal cord compression, with paraparesis and paraplegia of the hind limbs and tail. These signs are strictly related to the spinal cord location and to the nerves roots affected. The paraparesis and paraplegia, clinical signs from the present report, which evolved to bilateral involvement, loss of proprioception and dyschezia, are consequences of the compression of ascending and descending fibers from the white matter (MARCASSO et al., 2015). Meningiomas metastasis are rare (MOTTA et al., 2012); nevertheless, in this report, it involved lungs, kidneys and urinary bladder, which corroborate with previous descriptions of extra neural metastasis in dogs, where the lung was the main organ affected (SCHULMAN et al., 1992).

Among the most frequent neoplasms involving the spinal cord in cats, lymphoma is the most observed, followed by osteosarcoma and glial cell tumors (MARIONI-HENRY, 2010), which were differentiated in the present case by the gross and microscopic features observed. Clinical signs similar to those observed in this cat can be caused by feline infectious peritonitis (FIP) (MARIONI-HENRY, 2010); however, typical pyogranulomatous lesions were not observed in the present report. The differential diagnosis of other glial cell neoplasms may be obtained by IHC (BARNHART et al.,

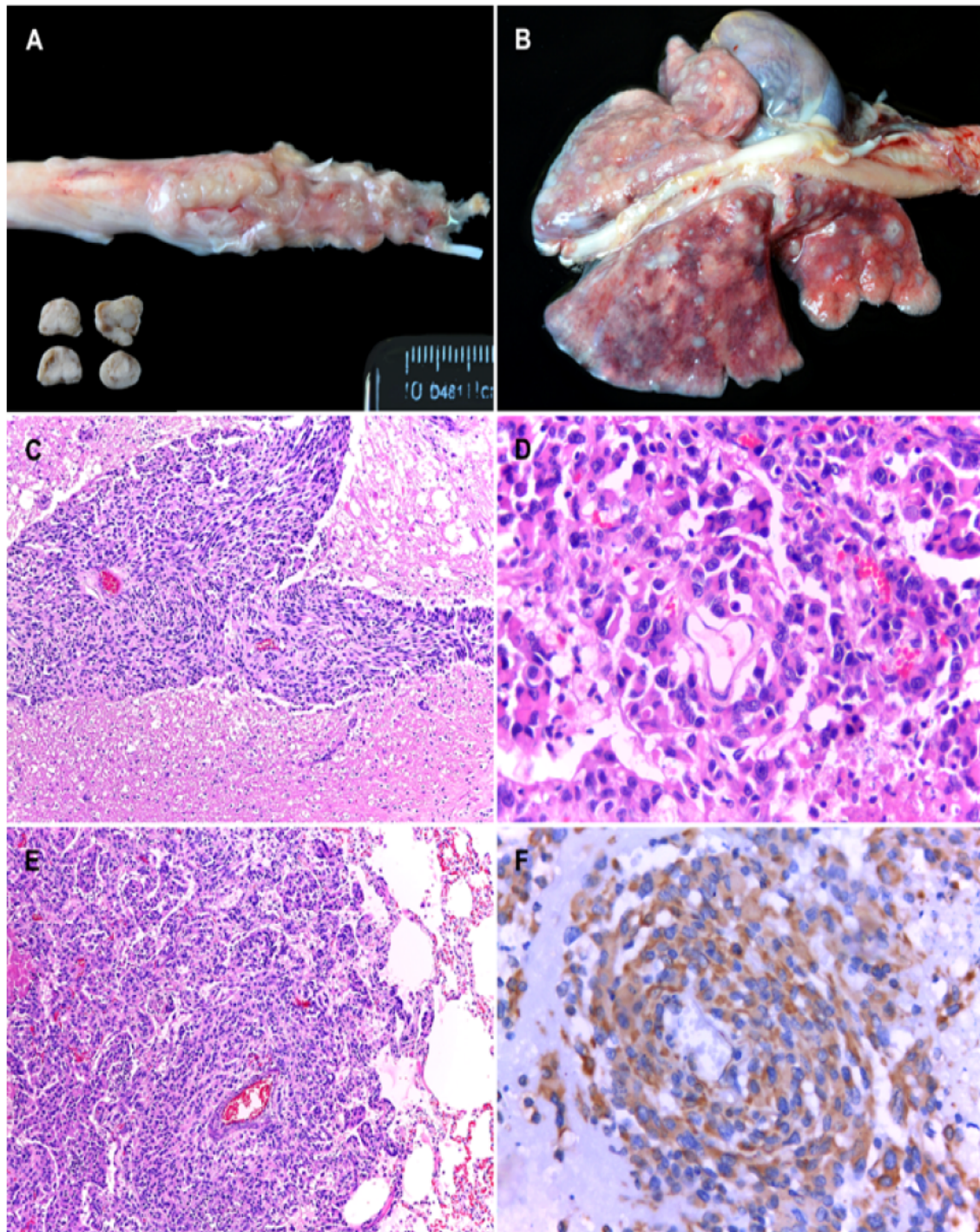


Figure 1 - Spinal cord anaplastic meningioma with extra neural metastasis in a cat. (A) A whitish irregular mass (4.4 x 1.2 x 0.6 cm) extended from the lumbar intumescence to the sacral region of the spinal cord. Detail: serial cuts showed that the neoplasm extended and infiltrated the white and grey matter of the spinal cord. (B) Multifocal to coalescing whitish round masses (0.2-0.5cm in diameter) were observed in the lungs. (C) The neoplasm was composed by an infiltrative proliferation of neoplastic cells arranged in bundles and whirls. HE, obj. 10X. (D) The neoplastic cells were pleomorphic, varying from spindle, arranged in bundles to round and epithelioid arranged in cohesive nests. HE, obj. 40X. (E) Similar neoplastic cells infiltrated and occupied the alveolar spaces in the lungs. HE, 10X. (F) A marked immunostaining for vimentin was observed in the cytoplasm of the neoplastic cells. Immunohistochemistry anti-vimentin, obj. 40X.

2002; MARCASSO et al., 2015). Independently of the histological classification, meningiomas are uniformly immunoreactive for vimentin expression (MARCASSO et al., 2015; MOTTA et al., 2012), while some tumors may present a variable immunostaining for cytokeratin (HIGGINS et al., 2017) and for S100 (BARNHART et al., 2002; MARCASSO et al., 2015), similarly to the observed in the present study. In addition to that, GFAP immunostaining was absent, which helped to differentiate this from glial stem cell origin neoplasms (HIGGINS et al., 2017).

Meningiomas are classified according to the neoplasm characteristics, such as tissue invasion, mitotic index, cellular pleomorphism, necrosis and extra neural metastasis, which are malignancy indicators, in addition to the classification in subtypes: meningothelial, fibromatous, transitional, psammomatous, among others (HIGGINS et al., 2017; LOUIS et al., 2016). Meningothelial, transitional and fibromatous meningioma subtypes are the most commonly reported in cats (MOTTA et al., 2012). The neoplasm of the present study was defined as an anaplastic meningioma, since it was composed by a mixture of fibromatous and transitional patterns intermixed by sheets of meningothelial cells with nervous ganglions infiltration, necrosis, cellular pleomorphism and high mitotic index (MARCASSO et al., 2015), besides extra neural metastasis. These neoplasm characteristics are uncommon in cats, since reports of highly malignant meningiomas are sparse in cats (LU et al., 2003; MOTTA et al., 2012).

Spinal cord anaplastic meningioma with extra-neural metastasis may occur in older cats with clinical signs mainly related to spinal compression (paraparesis and paraplegia). Histologically, anaplastic meningioma is a highly pleomorphic tumor, and, thus, IHC analysis is an important tool for the definitive diagnosis of the neoplasm.

BIOETHICS AND BIOSECURITY COMMITTEE APPROVAL

We authors of the article entitled “Spinal cord anaplastic meningioma with extra-neural metastasis in a cat” declared, for all due purposes, that the project that gave rise to the present data of the same has not been submitted for evaluation to the Ethics Committee of the Universidade Federal do Rio Grande do Sul (UFRGS), but we are aware of the content of the Brazilian resolutions of the Conselho Nacional de Controle de Experimentação Animal (CONCEA) if it involves animals. Thus, the authors assume full responsibility for the presented data and are available for possible questions, should they be required by the competent authorities.

DECLARATION OF CONFLICTING OF INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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