

Hemangiopericytoma in a senior cat - a case report

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ABSTRACT

Even though hemangiopericytoma cases are common in humans and dogs, research so far indicates that they rarely occur in cats. A 13-year-old cat was admitted to an animal hospital with a bleeding mass located close to the caudal mammary glands. No abnormalities were detected in the complete blood count or serum chemistry profile. Following the results of cytology of a fine needle aspiration sample, complete removal of the mass was performed. Hemangiopericytoma was diagnosed by pathological and immunohistochemical analyses of the mass with CD31, vimentin, desmin, SMA, GFAP, SOX-10, S100B and pan-Cytokeratin. Metastasis or recurrence was not observed in the 10-month period after surgery. Compared to previous cases of feline hemangiopericytoma, this is the first cytologically examined tumor located in the mammary gland region, and represents the fourth feline hemangiopericytoma case in the literature.

Key words: cat; cytology; hemangiopericytoma; immunohistochemistry; vascular tumor

Introduction

Hemangiopericytomas were first identified in 1942 by Stout and Murray (STOUT and MURRAY, 1942). The origin of hemangiopericytomas has been a controversial issue in veterinary medicine for a long time. According to some authors, hemangiopericytomas originate from perivascular cells, while others state that the tumor originates from perineural cells (AVALLONE et al., 2019). Other authors state that hemangiopericytomas originate from pericytes encircling capillary veins (ENZINGER and WEISS, 1995; GROSS et al.,

2005; WANG et al., 2020). A further opinion is that these tumors arise from different cell types e.g. perivascular wall and adventitial cells (AVALLONE et al., 2007). Immunohistochemical markers such as S-100 can give us information about the origin of the cell (AVALLONE et al., 2019). Hemangiopericytomas can be found anywhere where veins are located (KITAHATA et al., 2010). In dogs, hemangiopericytomas are mainly observed in the extremities (HENDRICK, 2017; MAZZEI et al., 2002; MILLS and NIELSEN, 1967;

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MULLIGAN, 1955). No gender susceptibility was noted in these tumors in dogs between the ages of 7-10 (HENDRICK, 2017; GRAVES et al., 1988). Hemangiopericytomas are locally aggressive, and are prone to recurrence, with low a tendency to metastasize (GRAVES et al., 1988; POSTORINO et al., 1988).

Hemangiopericytomas also occur in humans, where the metastatic ability of these tumors is variable (ENZINGER and WEISS, 1995). Despite hemangiopericytoma cases being rare in cats, the pathological attributes of these tumors in cats resemble the morphological structure of these tumors in humans more closely than such tumors in dogs (BALDI and SPUGNINI, 2006). In humans, hemangiopericytomas consist of round oval cell packages, and staghorn-like structures which branch out from a thin-walled center (ENZINGER and WEISS, 1995). Hemangiopericytomas observed in canine patients, however, manifest as several fingerprint-like whorls around central veins (BLUTKE et al., 2012).

The diagnosis of this tumor may be challenging. Although cytology is more effective in the diagnosis of tumors of non-mesenchymal origin, such as carcinoma and lymphoma (LAYFIELD et al., 1986), cytology is not as diagnostically accurate for hemangiopericytomas. However, cytology can be useful in managing tumor metastasis (CHHIENG et al., 1999). It is almost impossible to diagnose hemangiopericytomas on the basis of morphological structure alone. Unlike other tumors of mesenchymal origin, human and canine hemangiopericytomas do not have the characteristic immunohistochemical antibodies (ENZINGER and WEISS, 1995; HENDRICK, 2017; GROSS et al., 2005). Hemangiopericytomas have a positive immune reaction only against vimentin. Immune-reactive antibody positivity to cytoskeletal and contractive proteins, neural markers, cell surface proteins, and extracellular matrix proteins are inconsistent (AVVALLONE et al., 2020; BLUTKE et al., 2012; CHIJIWA et al., 2004; ENZINGER and WEISS, 1995; HENDRICK, 2017; GROSS et al., 2005; HANDHARYANI et al., 1999; MAZZEI et al., 2002; SAWAMOTO et al., 1999). Surgical intervention for hemangiopericytomas in dogs has

a success rate of over 70% (HENDRICK, 2017; MAZZEI et al., 2002; MULLIGAN, 1955). In the past, electrochemotherapy application led to successful results in a hemangiopericytoma case located in the thoracic region of a cat (BALDI and SPUGNINI, 2006).

Case presentation

A 13-year-old spayed, mixed breed cat presenting with a bleeding mass, protruding over the caudal abdominal mammary lobe (Fig. 1A), was admitted to our animal hospital. Complete blood count and blood chemistry results, together with tT4 value, were within normal range. There was mild hyperkalemia. The owner stated that they had noticed the mass 3-4 months before. The mass measured 4 cm in diameter. Following a preoperative diagnostic workup and the preoperative evaluation, a decision was made to surgically remove the mass. The mass was completely resected with wide margins. In checks performed within the 10 months following surgery, neither recurrence nor metastases were detected. No abnormalities were observed in the cat's condition either locally or systemically.

Samples taken from the mass using the FNA technique were stained with routine Wright's stain (Sigma-Aldrich Wright's eosin methylene blue solution, 1.01383). On cytological examination (Fig. 1B), cellular samples revealed clusters of erythrocyte-filled areas. Tumor cells were round to oval in shape, with a slightly prominent cytoplasm, and a high nucleus: cytoplasm ratio. The nuclei of the cells were round, elongated and had a coarse chromatin structure; the nucleolus appeared pronounced in some cells, with an apparent, but slight, basophilic stain in some cells. Mostly only a single nucleolus was detected (Fig. 1C). Intercellular eosinophilic collagen material was markedly present. There were no significant atypia, mitotic figures, intra-cytoplasmic vacuoles or endothelial capillary veins.

The material obtained from surgery was fixed in 10% formaldehyde. 4µm sections were cut from paraffin-embedded tissue samples, which were then stained with Hematoxylin eosin. A histopathological examination of cross-sections indicated high

cellularity, and that these cells encircled the capillary veins in a spiral manner. The tumor cells were round, oval, with large nuclei and an indistinct cytoplasm. The tumor cells encircling veins did not show any atypia, they were rather uniform and presented 4 to 6 mitotic figures in high power view. Expanded areas of degeneration and necrosis were located around the tumor cells, with a characteristic perivascular growth pattern (Fig. 1D).

The standard avidin biotin peroxidase method was used in the immunohistochemical examination of tumor tissue cross-sections. At the end of the staining procedure, vimentin reacted diffusely positively (Fig. 1F) whereas CD31 had a cytoplasmic immune-positive reaction in the endothelial layers of the veins (Fig. 1E). Desmin, SMA, GFAP, SOX-10, S100B, and MNF116 reacted negatively.

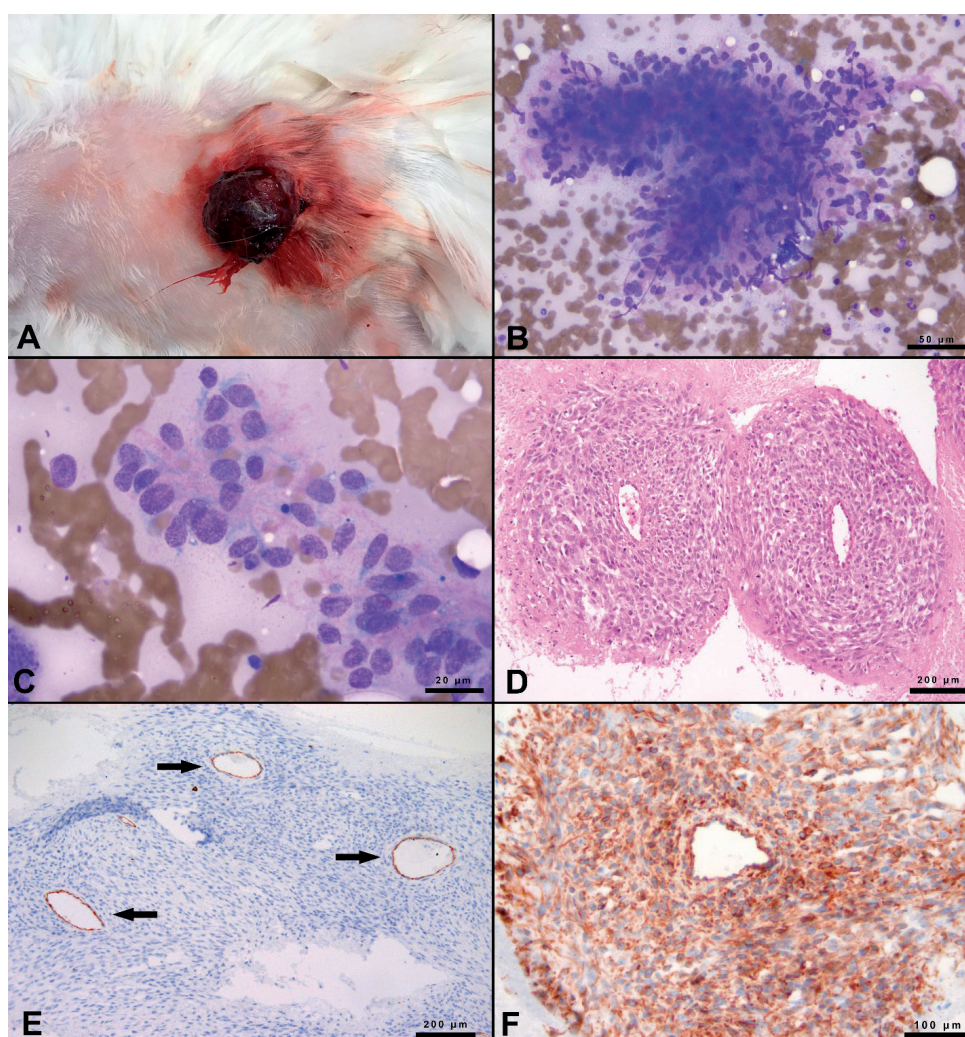


Fig. 1. A) Hemangiopericytoma in the caudal abdominal mammary region, as a solid mass with ulceration and hemorrhage; B) Clusters of mesenchymal cells, and eosinophilic material surrounding spindle cells. Erythrocyte-rich on background. x10 (wright stain, Bar=50µm); C) Oval, spindle-shaped cells with pale cytoplasm. Anisocytosis, anisokaryosis and coarse chromatin seen in cells. x40 (wright stain, Bar=20µm); D) Characteristic perivascular growth pattern of the tumor. Spindle polygonal cells packed around vessels. Hematoxylin and eosin. x40 (H&E, Bar=200 µm); E) CD31, arrows shows the positive reaction endothelial layer of the vessels. x10 (Bar=200 µm); F) Vimentin, cytoplasmic positive diffuse reaction in endothelial cells (Bar=100 µm).

Discussion

Previous cases of hemangiopericytoma have been observed in cats of two, five and ten years of age, while in the present case, the cat was thirteen years old. It may be concluded that this tumor type has a wide age range (BALDI and SPUGNINI, 2006; BLUTKE et al., 2012; HAYATI et al., 2021). It also seems that this particular tumor does not have only one specific location. In dogs this tumor type is noted mainly in the extremities, whereas in previous cases in cats, tumors occurred in thoracic, intraabdominal and hind limb regions (HENDRICK, 2017; MAZZEI et al., 2002; MILLS and NIELSEN, 1967). Additional data from more cases are needed to obtain a clearer picture of any breed predisposition, age, location, and prognosis for hemangiopericytoma.

Hemangiopericytomas display morphological features similar to peripheral nerve sheath tumors, which can make it very difficult to differentiate them (GROSS et al., 2005). S-100 and GFAP showed a positive immunoreaction in peripheral nerve sheath tumors (HENDRICK, 2017; GROSS et al., 2005; SCHULMAN et al., 2009). In this case, S-100, SOX-10 and GFAP had a negative immune reaction.

A negative reaction to Desmin and SMA antibodies indicated to the author that it was not a neoplasia originating from muscles. Moreover, an epithelial cell antibody, namely MNF116, also reacted negatively.

In conclusion, macroscopic, cytological and immunohistochemical examinations demonstrated that this mass, which was diagnosed as a hemangiopericytoma, may have originated from the mammary veins. The entirety of the mass was surgically removed, and no local recurrence or distant metastasis has been observed to date. Taking into account the pathological similarities of this tumor in dogs and humans, the treatment of choice is surgical removal. The prognosis for hemangiopericytoma, and assessment of the most effective treatments for this type of tumor, will require more data from further cases. Obtaining these data may be challenging, as this is a very rare tumor type, with a limited number of past cases,

located in various body parts. Increased awareness in clinicians and pathologists of this tumor type, and the referral of suspected cases for specialist pathological assessment, may enable more cases to be assessed and more data to be collected.

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SAŽETAK

Premda su hemangiopericitomi česti u ljudi i pasa, istraživanja pokazuju da se oni u mačaka vrlo rijetko pojavljuju. Mačka stara 13 godina primljena je u veterinarsku bolnicu s tvorbom koja je krvarila i koja je bila smještena kaudalno od mliječnih žlijezda. Kompletna krvna slika i biokemijski profil seruma nisu pokazali odstupanja. Provedena je citološka punkcija aspiracijom pomoću tanke igle pri čemu je uklonjena kompletna tvorba. Hemangiopericitom je dijagnosticiran patološkom i imunohistokemijskom analizom tvorbe s CD31, vimentinom, desminom, SMA, GFAP, SOX-10, S100B i pan-citokeratinom. U desetomjesečnom razdoblju nakon kirurškog uklanjanja tvorbe nisu uočene metastaze ni recidivi. U usporedbi s prethodnim slučajevima hemangiopericitoma u mačaka ovo je prvi citološki analiziran tumor koji se nalazi u području mliječnih žlijezda i ujedno je četvrti slučaj hemangiopericitoma u mačaka opisan u literaturi.

Ključne riječi: mačka; citologija; hemangiopericitom; imunohistokemija; vaskularni tumor
