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NEOPLASTIC DISEASE

Cutaneous Angioleiomyoma in a Black-Tailed Prairie Dog (*Cynomys iudovicianus*)

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Summary

A 3-year-old male black-tailed prairie dog (*Cynomys iudovicianus*) was presented with a dome-shaped cutaneous mass over the left femur. Microscopically, the mass was encapsulated and composed of proliferating spindle cells arranged in haphazard, interlacing bundles. There were vascular structures within the mass and some spindle cells had transitioned from the peripheral regions of the vascular wall. Immunohistochemically, the cells expressed vimentin, α-smooth muscle actin, desmin and heavy caldesmon. Based on these findings, the mass was diagnosed as a cutaneous angioleiomyoma. To the best of our knowledge, this is the first case of cutaneous angioleiomyoma in a black-tailed prairie dog.

Keywords: angioleiomyoma; immunohistochemistry; prairie dog; skin

The black-tailed prairie dog (*Cynomys iudovicianus*) is a rodent belonging to the family Sciuridae and is native to the grasslands of North America. It is commonly kept in zoological parks; however, these animals are also sometimes kept as pets (Thas and Garner, 2012). In Japan, importing these animals was made illegal in 2003 due to their role in the spread of infections such as plague and tularaemia; therefore, the only black-tailed prairie dogs left in Japan are those that were imported before the ban. A recent review examined neoplastic disease in 167 black-tailed prairie dogs in the USA, and odontoma and hepatocellular adenocarcinoma were reported to be the most common tumours (Thas and Garner, 2012). Only four cases of primary cutaneous tumours in black-tailed prairie dogs have been reported and those tumours were an adenocarcinoma, a basal cell tumour, a squamous cell carcinoma and a cutaneous lymphoma (Thas and Garner, 2012). The metastasis of multicentric lymphoma to the skin has also been reported (Miwa *et al.*, 2006). In this report, we describe the first case of primary cutaneous angioleiomyoma in a black-tailed prairie dog.

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A 3-year-old male black-tailed prairie dog was presented with a solitary macule (0.7 × 0.6 cm) on the skin of the left femoral region. The mass grew slowly and became painful. A dome-shaped mass (1.4 × 1.0 × 0.9 cm) was surgically excised 1 year after the initial presentation.

The mass was fixed in 10% neutral buffered formalin, processed routinely and embedded in paraffin wax. Sections (4 μm) were stained with haematoxylin and eosin (HE), alcian blue (at pH of 2.5) and Masson's trichrome stains and immunohistochemistry (IHC) was performed using the avidin–biotin–peroxidase complex procedure (Vectastain Elite ABC Kit; Vector Laboratories, Burlingame, California, USA). The following primary antibodies were used: mouse monoclonal antibodies specific for porcine vimentin (V9; Dako, Glostrup, Denmark; diluted 1 in 100), human α-smooth muscle actin (α-SMA; 1A4, Dako; diluted 1 in 100), human desmin (D9; Progen, Heidelberg, Germany; diluted 1 in 80), human neurofilament (2F11; Dako; diluted 1 in 100), human cytokeratin (AE1/AE3; Nichirei, Tokyo, Japan; prediluted), human heavy caldesmon (smooth muscle caldesmon; N5/22; Chemicon, Temecula, California, USA; diluted 1 in 100) and rabbit

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polyclonal antibodies against bovine S100 (Dako; diluted 1 in 300) and human factor VIII (Nichirei, prediluted). 3,3′-diaminobenzidine was used as a chromogen and the sections were counterstained with haematoxylin. The vascular wall, subcutaneous nerve fibres and epidermis were used as positive controls for the detection of α-SMA, desmin and heavy caldesmon, S100 and neurofilament, and cytokeratin, respectively. The antibody against factor VIII did not work in the present study.

Microscopically, the mass was located in the dermis and was well circumscribed and encapsulated by a thin fibrous capsule. It had compressed the adjacent follicular structures and dermal collagen fibres and was composed of proliferating spindle cells arranged in haphazard, interlacing bundles. The cells had oval to elongated nuclei, eosinophilic spindle-shaped cytoplasm and indistinct cell boundaries. Regions of collagenous tissue of varying thickness (i.e. from fine fibrils to islands of collagenous material) were interspersed between the bundles. A few slender cells were distributed alongside the collagenous tissue. Small to thick-walled blood vessels were randomly distributed throughout the mass and bundles of proliferating spindle cells sometimes transitioned from the peripheral regions of the vascular wall (Fig. 1). The vascular walls were often vacuolated. Alcian blue staining detected multifocal deposits of a myxoid material in the collagenous stroma and vacuolated vessel walls. Masson's trichrome stained the bundles of spindle cells red and the capsular and stromal tissue blue. The proliferating spindle cells expressed vimentin, α-SMA (Fig. 2A), desmin (Fig. 2B) and heavy caldesmon (Fig. 2C), but were negative for cytokeratin, S100 and neurofilament. The vascular wall cells showed diffuse expression of α-SMA (Fig. 2A) and heavy caldesmon (Fig. 2C). Positive labelling of desmin was detected in cells beneath the endothelial cells (Fig. 2B). Based on these histological and immunohistochemical findings, the lesion was diagnosed as a cutaneous leiomyoma that was closely associated with blood vessels (i.e. an angioleiomyoma). The slender cells in the collagenous stroma expressed vimentin, but not α-SMA, desmin or heavy caldesmon, which indicated that they were fibroblasts.

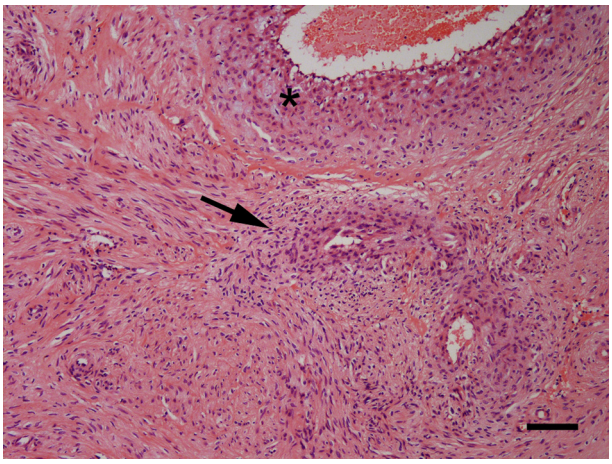

Fig. 1. Spindle-shaped neoplastic cells in interlacing bundles. Note the transition of cells from the peripheral regions of vascular structures to areas of neoplastic proliferation (arrow) and the vacuolated vascular wall (asterisk). HE. Bar, 100 μm.

Smooth muscle tumours are the most common neoplasms of the gastrointestinal tract in domestic animals. They occur most frequently in dogs and are much less common in other species (Cooper and Valentine, 2002). IHC is often used to detect smooth muscle cell differentiation in human and veterinary pathology (Brooks, 1994; Cooper and Valentine, 2002) and α-SMA and desmin can be used to identify cells of smooth muscle origin. Well-differentiated smooth muscle tumour cells tend to be diffusely and uniformly labelled for both antigens. Heavy caldesmon is a calcium-dependent protein that regulates contraction and was specifically detected in angioleiomyoma/sarcoma among canine cutaneous perivascular wall tumours, including glomus tumour, haemangiopericytoma, myopericytoma, angioleiomyoma/sarcoma, angiomyofibroblastoma and angiofibroma (Avallone *et al.*, 2007). Special stains, such as Masson's trichrome stain, can also be used to identify muscle differentiation. In the present case, IHC and special stains detected proliferating spindle-shaped cells that had originated from vascular smooth muscle.

Cutaneous smooth muscle tumours are rare, but have been studied in dogs, cats and ferrets (Finnie *et al.*, 1995; Mikaelian and Garner, 2002; Liu and Mikaelian, 2003) and have also reported in a cow (Hanzaike *et al.*, 1995), a sow (Nakamura *et al.*, 1987) and a Peruvian squirrel monkey (Brunnert *et al.*, 1990). Cutaneous leiomyomas and leiomyosarcomas usually occur as solitary, raised, minimally to non-ulcerated, expansile nodular to multinodular, solid dermal tumours (Cooper and Valentine, 2002). Microscopically, the cells of cutaneous leiomyomas are more pleomorphic than those of leiomyomas that develop at other sites; however, they rarely display mitotic figures. It is possible to differentiate between benign and malignant lesions based on the presence of invasive growth, higher mitotic rate and increased cellularity and cellular atypia of the latter. In man and animals, cutaneous smooth muscle tumours are classified into three types based on their origins: tumours derived from vascular smooth muscle tissue (angioleiomyoma and angioleiomyosarcoma), those derived from arrector pili muscles (piloleiomyoma

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