



# Subcutaneous extraskeletal chondroblastic osteosarcoma in a cat

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## Abstract

**Case summary** An 11-year-old neutered male cat was presented with a fixed, subcutaneous mass in the left hindlimb. The neoplasm was surgically removed and determined to be a 2 × 2 × 9 cm mass that extended over the plantar surface of the left hindlimb from the tarsus to the phalanges. It was independent from the skeletal system but firmly attached to the adjacent connective tissue. Microscopically, the neoplasm was composed of highly proliferative mesenchymal neoplastic cells that formed both osseous and cartilaginous tissues with associated production of chondroid, osteoid and associated matrixes. This neoplasia was diagnosed as an extraskeletal chondroblastic osteosarcoma. Extraskeletal osteosarcomas, especially the chondroblastic subtype, are extremely rare in cats. Consequently, little is known concerning their course and prognosis. In this case, excision with wide margins appeared to be successful as, at the time of writing, 24 months after limbectomy, the cat is healthy with no evidence of recurrence or metastasis.

**Relevance and novel information** To our knowledge, this is the first report of an appendicular large extraskeletal chondroblastic osteosarcoma occurring in a domestic cat. As these neoplasms are rare, it should be considered as a less likely cause of soft tissue appendicular neoplasms in domestic cats.

**Keywords:** Chondroblastic osteosarcoma; extraskeletal; limb; surgery; histopathology

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## Introduction

Extraskeletal osteosarcoma is an extremely rare tumor that is characterized by a proliferation of mesenchymal cells producing osteoid/osseous tissue without having a detectable association with the skeletal system. This neoplasm has been reported in a variety of animals.<sup>1,2</sup> Feline extraskeletal osteosarcoma has been described in the subcutaneous tissue,<sup>3–5</sup> eyes,<sup>3,6</sup> liver,<sup>7</sup> oral cavity,<sup>3</sup> intestines/omentum<sup>8</sup> and in the mammary region.<sup>3</sup> Of the reported subtypes, the extraskeletal chondroblastic osteosarcoma is reported to be very rare.<sup>3–5</sup> Though mentioned in several textbooks, we found only one report of extraskeletal chondroblastic osteosarcoma in a domestic cat.<sup>9</sup> The objective of this case report is to describe an extraskeletal chondroblastic osteosarcoma in the subcutaneous tissue of a hindlimb in a domestic cat.

## Case description

An 11-year-old crossbred neutered male cat was presented to the Central Veterinary Hospital, Veterinary Faculty, University of the Republic, Uruguay with a firm swelling in its left hindlimb. The neoplasm was

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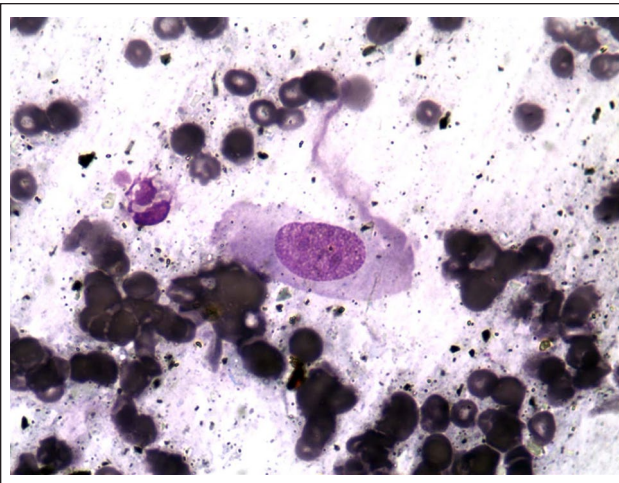
identified and observed to be a continuously growing, poorly defined mass of about 2 months' duration. Several weeks prior to consultation, the cat was treated by the owner with prednisone (10mg/24days) with no observed alteration in growth or size. The cat was housed indoors with one other adult female cat, and there were no previously observed incidences of trauma or inter-cat aggression. This cat had been previously diagnosed and treated for urinary tract calculi and infection from which it appeared to have completely recovered.

On presentation, the patient had a glossy coat, was alert and responsive, and weighed 6.4kg, which was considered to be moderately obese. On physical examination, the appendicular mass was identified as a firm, adhered, non-painful neoplasm with no defined borders. It was approximately  $2 \times 2 \times 9$  cm and confined to the subcutis and connective tissues on the plantar side of the left hindlimb. It was about 9 cm long from the digits to the tarsus. The cat appeared otherwise normal. Fine-needle aspiration and cytologic evaluations (Figure 1) identified spindle-shaped dysplastic cells with macronuclei and atypical nucleoli typical of malignant transformation. As these cytological features are suggestive of a malignant mesenchymal neoplasm, a presumptive diagnosis of sarcoma was made. Thoracic radiographs were normal, with no signs of metastatic neoplasia. A complete blood cell count, hepatic and renal biochemistry, and urinalysis revealed only mild increased activity of serum alkaline phosphatase (138 IU/l), as would be expected with the history of previous steroid therapy.

Based on the extensive tumoral growth without defined borders and the cytological confirmation, excision with wide margins was indicated and left hindlimb amputation was recommended. This was performed using isoflurane (Ineltano Vet; Richmond Vet Pharma) as the inhalatory anesthetic, and meloxicam 0.1 mg/kg body weight (BW) (Meloxicam Injectable; John Martin) plus tramadol 2 mg/kg BW (Tramadol Injectable; Brouwer) for subcutaneous postoperative analgesia for the first 24 h. After amputation, analgesia was maintained with meloxicam 0.1 mg/kg BW for 5 days, after which the dose was reduced by 0.05 mg/kg BW per day for another 5 days.

Grossly, the tumor was confined to the subcutaneous tissues and it extended from the phalanges to the tarsus of the left hindlimb. It was distinctly separate from the bones and joints (Figure 2). The surface was firm, white or grayish-white, and irregularly hard and nodular. Upon dissection, some of the nodules or hard foci contained mucoid or mucous-like fluid.

A representative section was collected, fixed in neutral-buffered 10% formalin and routinely processed, sectioned and stained for histologic examination. Microscopically, the mass was composed of mesenchymal neoplastic cells that varied from



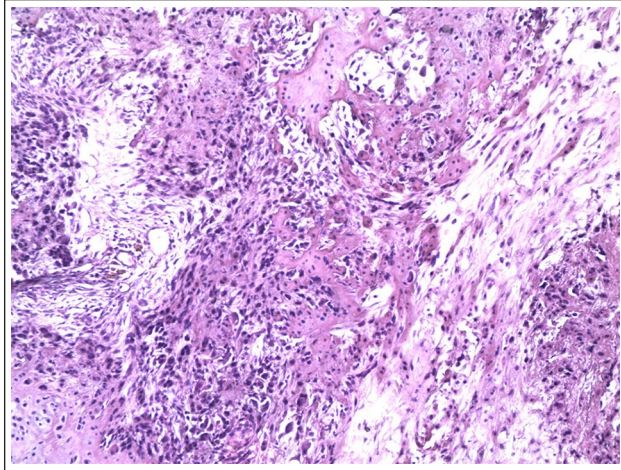
**Figure 1** Cytologic findings. A spindle-shaped dysplastic cell with macronucleus and two atypical nucleoli. Diff-Quick stain,  $\times 1000$  magnification



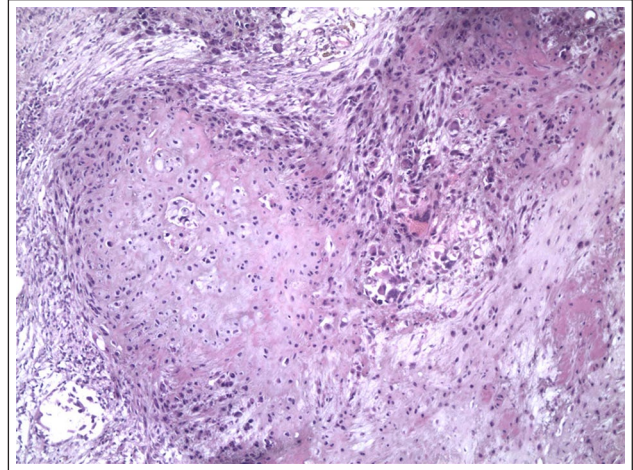
**Figure 2** Gross findings. Tumor is observed subcutaneously throughout the plantar tarso digital region of left hindlimb

spindle-shaped cells to larger round or pleomorphic-shaped cells. Nuclei were circular to polymorphic. The neoplastic cells often had anisocytosis, anisokaryosis, prominent nucleoli and nuclear hyperchromasia. Mitotic figures were rare. The tumor cells produced osteoid tissue, as well as mineralized osseous tissues. Small numbers of large, multinucleated cells – most likely osteoclasts – were also observed around neoplastic ossified tissue (Figures 3 and 4). In addition, the neoplastic cells formed large islands of cartilage tissue (Figures 5 and 6). Endochondral ossification was not detected. Some small foci contained pools of mucoid (mucus-like) material where the neoplastic cells were sparse (Figure 7). Both the cartilage matrix and mucus-producing areas were positive for Alcian blue (Figure 8). Less frequently, there were zones of massive necrosis and inflammation with focal lymphoplasmacytic accumulations.

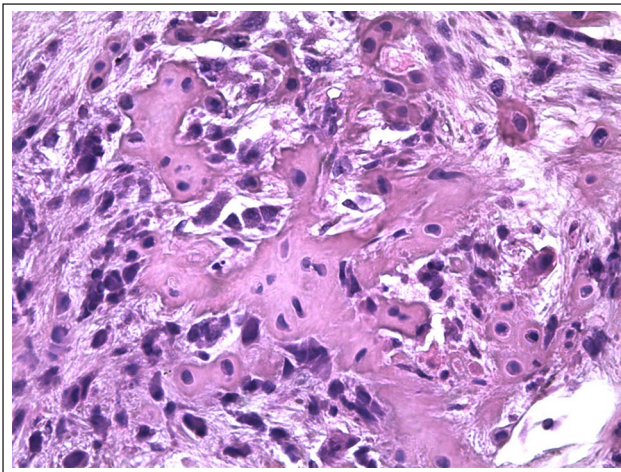
In summary, the neoplasm was diagnosed as an extraskeletal chondroblastic osteosarcoma. For 24 months after treatment, while this report was in preparation, the cat continued in apparently good condition, and no recurrence or metastasis has been identified.



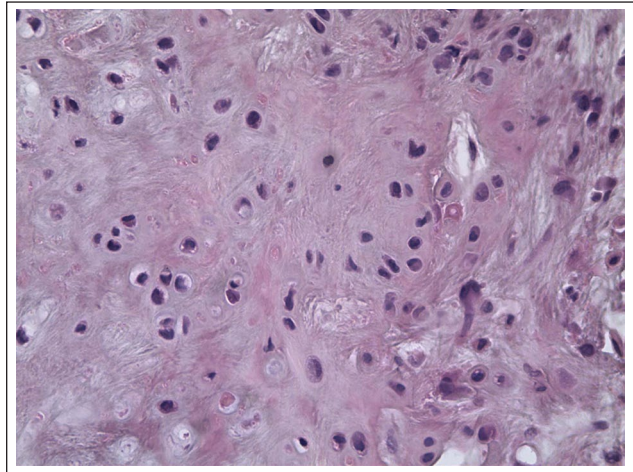
**Figure 3** Histopathological findings. The tumor cells produce osseous tissues. Hematoxylin and eosin stain,  $\times 40$  magnification



**Figure 5** Histopathological findings. The tumor cells produce chondrocytic tissues. Hematoxylin and eosin stain,  $\times 40$  magnification



**Figure 4** Histopathological findings. High magnification of Figure 3. Atypical tumor cells produce osseous tissue, and osteoclastic cells are also observed. Hematoxylin and eosin stain,  $\times 400$  magnification



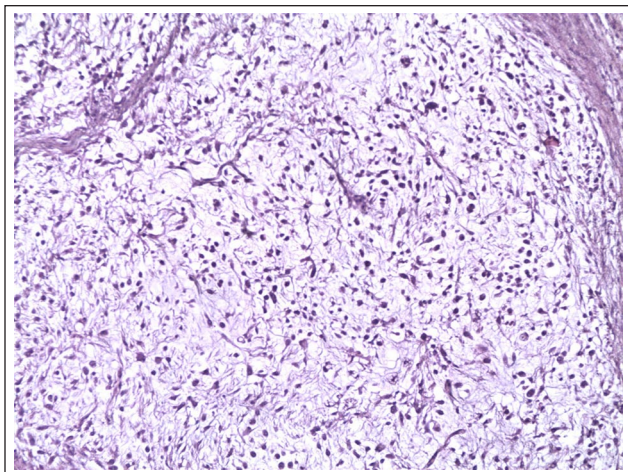
**Figure 6** Histopathological findings. High magnification of Figure 5. Atypical tumoral cells produce chondrocytic tissue. Hematoxylin and eosin stain,  $\times 400$  magnification

## Discussion

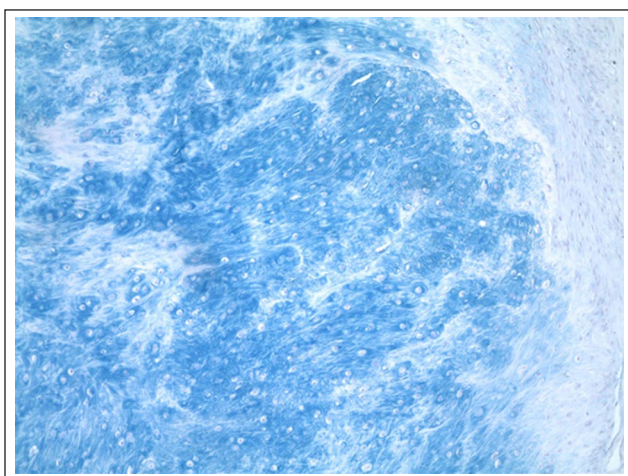
The histologic appearance of osteosarcomas varies, but is characterized by neoplastic cell production of osteoid and/or osseous tissues.<sup>1,2,5</sup> Osteosarcomas have been further divided into different morphological subtypes, including osteoblastic, fibroblastic, chondroblastic, telangiectatic and mixed cell types.<sup>1,2</sup> In the present case, the neoplastic cells produced osteoid and osseous tissues with large zones of prominent cartilaginous differentiation characterized by production of cartilage matrix/cartilage tissue with extracellular accumulation of collagen and mucoid-appearing, Alcian blue-staining extracellular material (most likely chondroitin, some other unidentified or mixed matrix). Several commonly used texts suggest that there are two previously reported

cases of extraskeletal subcutaneous chondroblastic osteosarcoma in domestic cats. Both directly produced osteoid and chondroid matrixes that dominated different areas within the neoplasms.<sup>1,2</sup> We were able to find only one other report of a extraskeletal chondroblastic osteosarcoma in the liver of a cat.<sup>9</sup>

Primary bone tumors are rare in domestic cats, accounting for 4.9% of all tumors. Feline extraskeletal osteosarcomas are even more rare as they correspond to approximately 40% of feline osteosarcomas.<sup>3,4</sup> Feline extraskeletal chondroblastic osteosarcomas are even rarer and, interestingly, this single report also described a conspicuous area of extracellular accumulation of mucus or mucoid-like material.<sup>9</sup> This phenomenon was also described in a case of feline extraskeletal



**Figure 7** Histopathological findings. Tumor cells produce mucus. Hematoxylin and eosin stain,  $\times 40$  magnification



**Figure 8** Histopathological findings. The matrix of cartilage is positive with Alcian blue stain,  $\times 40$  magnification

chondrosarcoma.<sup>10</sup> Mesenchymal neoplastic cells are considered to have the ability to produce mucus-like material that has been suggested to be osteoid or chondroid fragments, or building components of cartilage or osseous tissues.<sup>10</sup> To our knowledge, there is no previous report of a large tumor of this kind on the hindlimb of a cat. As this neoplasm is extremely rare in cats it should probably only be considered when more common causes of dermal appendicular masses have been excluded.

The cause of feline extraskelatal osteosarcomas is unknown. As they frequently occur in cats in subcutaneous tissues in association with vaccination granulomas, chronic inflammation is a likely cause.<sup>3,4</sup> This is supported by reports that document trauma and its associated inflammation which have been linked to the development of human extraskelatal osteosarcoma.<sup>11</sup> This mechanism probably plays a role in feline neoplastic transformation as two cases of post-traumatic osteosarcoma in the eye

have been reported.<sup>6,12</sup> As the tarsal region of the hindlimb is an unlikely vaccination site in cats, this is probably not a vaccine-related neoplastic process; however, cats commonly develop distal limb traumatic lesions, especially from bite wounds. As there was no history of injections or trauma in this cat, the cause remains unknown.

Extraskelatal osteosarcomas have been reported to metastasize to the lungs, kidneys, liver, brain and spleen in approximately 10% of cases.<sup>13</sup> In this cat, neither recurrence nor metastasis have been detected after 24 months of follow-up after surgery. Certainly, more cases are required before any certainty might be assigned to the effectiveness of surgical excision.

## Conclusions

To our knowledge, this is the first report of an appendicular, large, extraskelatal chondroblastic osteosarcoma occurring in a domestic cat. This neoplasm is rare and it should be considered as an unlikely cause of soft tissue appendicular neoplasm in domestic cats.

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**Ethical approval** This work involved the use of non-experimental animals only (owned or unowned), and followed established internationally recognized high standards ('best practice') of individual veterinary clinical patient care. Ethical approval from a committee was not necessarily required.

**Informed consent** Informed consent (either verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work for the procedure(s) undertaken. No animals or humans are identifiable within this publication, and therefore additional informed consent for publication was not required.

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