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Rare diagnosis of intraosseous lipoma in the scapula of a 15-year-old domestic shorthair cat

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Abstract

Case summary A 15-year-old male castrated domestic shorthair cat originally presented to its primary care veterinarian with a chief complaint of a multi-month history of decreased appetite, weight loss and mild weight-bearing lameness. On physical examination, over the right scapula there was mild-to-moderate muscle wasting and a palpable firm, bony mass measuring approximately 3.5 cm × 3 cm. A complete blood count, chemistry panel, urinalysis, urine culture and baseline thyroxine were clinically unremarkable. Further diagnostics included CT, which revealed a large, expansile, irregularly mineralized mass centered over the caudoventral scapula at the site of attachment of the infraspinatus muscle. Following wide surgical excision by means of complete scapulectomy the patient regained function of the limb and has been free of disease since. The clinical institution's pathology service examined the resected scapula with associated mass and diagnosed an intraosseous lipoma.

Relevance and novel information Intraosseous lipoma is a rare form of bone neoplasia that has only been reported once in the small animal veterinary literature. Histopathology, clinical signs and radiographic changes were consistent with what is described in human literature. It is hypothesized that these tumors occur because of invasively growing adipose tissue within the medullary canal following trauma. Considering the rarity of primary bone tumors in cats, intraosseous lipomas should be considered as a differential diagnosis in future cases with similar signs and history.

Keywords: Intraosseous lipoma; scapulectomy; primary bone tumor; bone neoplasia; scapular mass

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Introduction

Primary bone tumors are uncommon in cats, with an estimated incidence of 4.9 per 100,000.¹ Up to 90% of feline bone tumors are histologically malignant with osteosarcoma comprising 70–80% of these cases.^{1,2} While radiographic and histopathologic changes of osteosarcoma are identical in dogs and cats, feline osteosarcoma has a lower metastatic rate of approximately 5% to 10% vs >90% in canine cases.¹ Other primary bone tumors, such as chondrosarcoma and fibrosarcoma, are exceedingly rare in cats.³ For malignant bone tumors, aggressive surgical resection remains the treatment of choice.^{3–7}

A lipoma is a benign tumor of adipose tissue that occurs with a lower frequency in cats than in dogs.⁸ The most common locations include the subcutaneous tissues of the trunk, gluteal region and proximal limbs.⁸

A rare manifestation of lipoma is intraosseous lipoma, which, to date, has only been described once in the veterinary literature in a 2-year-old Leonberger.⁷ In humans, the reported prevalence of intraosseous lipoma in bone tumors is 1/1000.⁹ It is hypothesized that these tumors occur as a result of invasively growing adipose within

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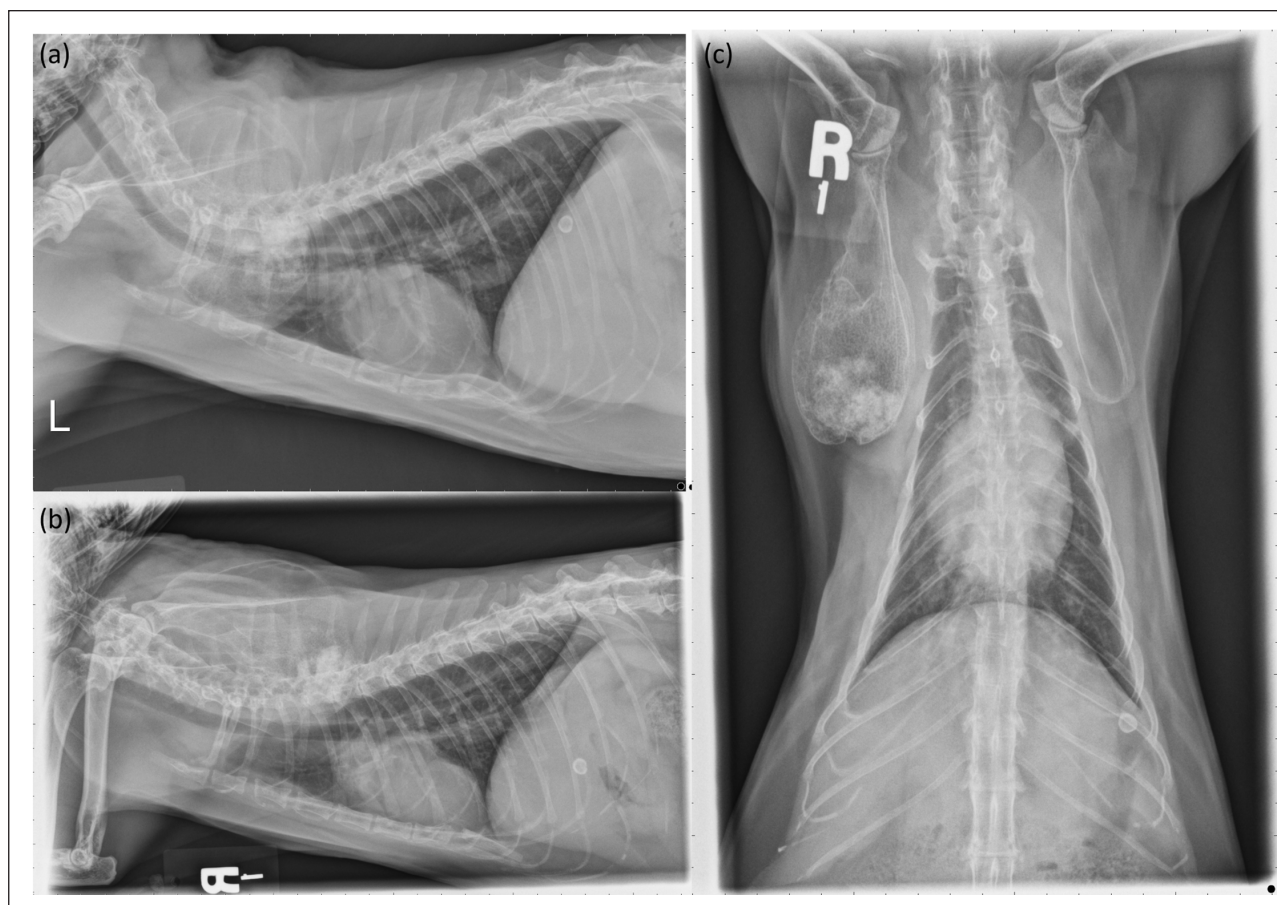


Figure 1 (a) Left lateral, (b) right lateral and (c) dorsoventral thoracic radiographs demonstrating a large expansile mass centered on the caudal angle of the right scapula that is characterized by proliferation/sclerosis and permeative to moth-eaten lysis

the medullary canal following trauma.^{10,11} This can lead to secondary periosteal proliferation of the bone and subsequent bone expansion.¹⁰ Mild clinical signs generally preclude a good outcome following surgical resection if applicable.³⁻⁷

This case report describes an intraosseous lipoma affecting the scapula in a 15-year-old male castrated domestic shorthair cat. To our knowledge, there are no reported cases of feline intraosseous lipoma in the veterinary literature.

Case description

A 15-year-old male castrated domestic shorthair cat was presented to the primary care veterinarian with a chief complaint of decreased appetite, mild weight-bearing lameness of the right forelimb and a multi-month history of unintentional weight loss. The cat did not have any other systemic signs of illness and had no past pertinent medical history. It was reportedly indoor only, was overdue for rabies and feline viral rhinotracheitis, calicivirus and panleukopenia (FVRCP) vaccinations, and had previously tested negative for feline leukemia virus/feline

immunodeficiency virus. On physical examination, no overt abnormalities were detected. A complete blood count (CBC), chemistry panel, urinalysis, urine culture and baseline thyroxine results were clinically unremarkable. Sedated thoracic radiographs revealed a lytic lesion on the caudal border of the right scapula, as well as a suspected pulmonary nodule.

The patient was referred for oncologic consultation at a veterinary specialty center 10 days after initial presentation to the primary care veterinarian. Thoracic radiographs were repeated, and no pulmonary parenchymal lesions were described (Figure 1); ultrasound was used to differentiate the previously reported pulmonary nodule as a focus of nodular fat necrosis. Abdominal ultrasound revealed diffuse small intestinal thickening, consistent with inflammatory bowel diseases vs small cell lymphoma, as well as a $1.7 \times 1.7 \times 1.4$ cm in diameter rounded mass noted in the left adrenal gland. CT of the thorax, forelimbs and abdomen revealed a large, expansile, irregularly mineralized mass centered over the caudoventral scapula at the site of attachment of the infraspinatus muscle (Figure 2). The mass did not extend



Figure 2 Dorsal thoracic CT showing a large expansive irregularly mineralized mass involving the right scapula

to the scapulohumeral joint or beyond the dorsal and mid-portions of the scapula. A thin wall of bone surrounded the stippled, irregular internal mineralization. The remainder of the study had findings supporting previous imaging studies but was otherwise unremarkable.

While the patient was under anesthesia, cytologic samples of the mass were obtained via fine-needle aspiration and submitted for review to a clinical pathologist at a reference laboratory. The diagnostic interpretation was morphologically unremarkable marrow tissue with no evidence of neoplastic cells.

The patient was presented to the University of Pennsylvania, Ryan Veterinary Hospital, 1.5 months after the initial diagnosis. On physical examination, a grade 3/6 left parasternal heart murmur was auscultated. Over the right scapula there was mild-to-moderate muscle wasting and a palpable firm, bony mass measuring approximately 3.5×3 cm. When the patient ambulated, there was a notable 3/5 right forelimb lameness. A CBC and chemistry panel were clinically unremarkable. Recheck ultrasound of the left adrenal gland showed that the mass was static in size. No evidence of heart disease was seen on echocardiogram. Diagnostic and treatment options were discussed, including surgical biopsy to obtain a definitive diagnosis of the scapular mass, forequarter amputation, scapulectomy and

palliative radiation therapy. The owners elected to move forward with a right total scapulectomy.

On the day of surgery, the patient was anesthetized and the surgical site was clipped, prepped and draped using a standard aseptic technique. The scapulectomy was performed routinely as described by Clarke and Findji.⁶ Following removal of the scapula, the glenohumeral joint capsule and ligamentous attachments were tacked to the periosteum of the first rib with a single interrupted horizontal mattress suture using 2-0 Prolene. The muscles were apposed with 2-0 PDS in horizontal mattress and simple interrupted patterns. The subcutaneous tissue was apposed using 3-0 Monocryl in a simple continuous pattern. Skin sutures were placed using 3-0 Ethilon in a cruciate pattern. The entire scapula and associated tissues were submitted in 10% formalin for histopathologic evaluation.

Immediately postoperatively, analgesia was managed with methadone (0.1 mg/kg IV q6h) and a single subcutaneous injection of robenacoxib (2.05 mg/kg) followed by oral administration (1.35 mg/kg PO q24h). Two days postoperatively, the cat was discharged from the hospital with buprenorphine (0.013 mg/kg PO q8–12h) and gabapentin (10.5 mg/kg q12h PO). A soft padded bandage was applied to the right thoracic limb and thorax to provide additional limb support during recovery. Five days after surgery, the patient returned for a recheck after the owner reported that the right front paw appeared swollen. The bandage was removed revealing mild irritation of the axillary skin. The incision was healthy and intact. At the time of suture removal, 17 days postoperatively, the incision was healed and all swelling of the right front paw was resolved. The patient was comfortably ambulating on all four limbs with only a mild gait abnormality.

The scapula was formalin-fixed (10% buffered formalin) and decalcified in 5% formic acid. Sections from the scapula were processed and stained, and then evaluated by pathologists at the authors' facility. Sections of tissue evaluated were comprised of histologically normal skeletal muscle surrounding lamellar cortical bone. Medullary bony trabeculae were compressed and thinned by lobules of well-differentiated adipocytes with large, clear vacuoles replacing the cytoplasm with peripheralization and compression of the nuclei (Figure 3). Cellular and nuclear pleomorphism were minimal and mitoses were not noted. Medullary bone marrow precursor cells were largely replaced by the neoplastic adipocytes. No evidence of vascular invasion or of periosteal invasion were noted. An intraosseous lipoma was diagnosed based upon the clinical, radiographic and histopathologic findings.

Discussion

Intraosseous lipoma is a rare form of bone neoplasia and has only been reported once in the small animal veterinary literature.⁷ In the case reported here, histopathology,

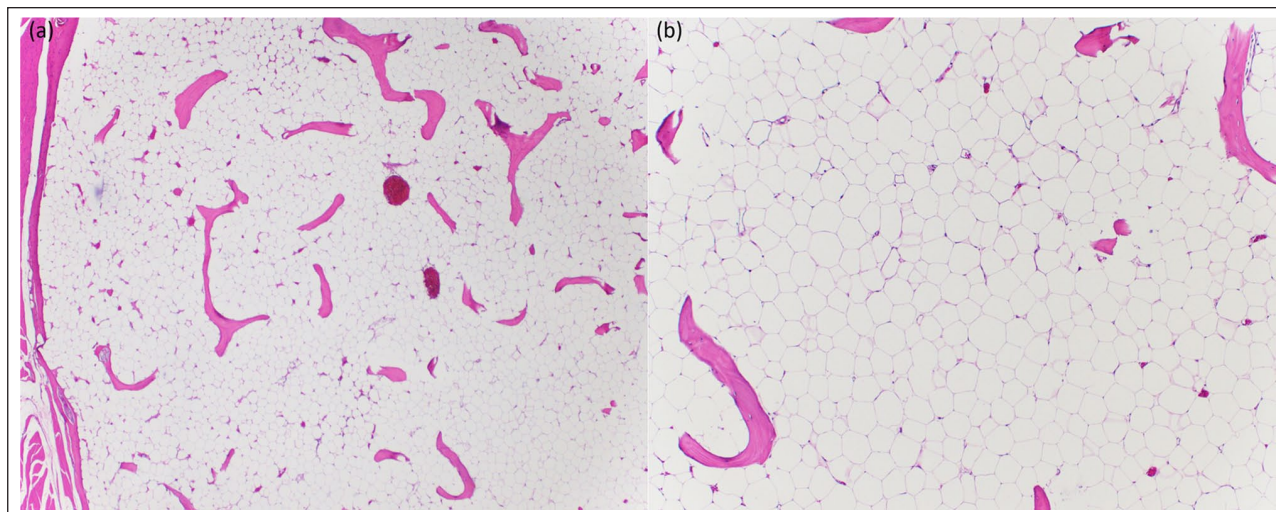


Figure 3 (a,b) Histology of the scapular mass. Hematoxylin and eosin stain

clinical signs and radiographic changes were consistent with what has been described in the human literature.

Intra-, para- and periosteal lipomas can be differentiated based upon their origin.^{10,11} While intraosseous lipomas develop within the medullary canal and break through bone via new bone formation, para- and periosteal lipomas can stimulate a periosteal reaction but do not affect the medullary canal.^{10,11} The most common lipoma – that arising from subcutaneous tissue – can rarely cause secondary bone defects through pressure or invasive growth.^{10,11} In the case reported here, the lipoma expanded the medullary canal, causing distension and thinning of the cortical bone, supporting the hypothesis that this represented an intraosseous lipoma.

In the veterinary literature there is a single report describing intraosseous lipoma in a 2-year-old intact female Leonberger.⁷ Similar to the case reported here, that patient presented for a history of chronic lameness in the right forelimb that was refractory to medical management.⁷ Radiographs showed extensive cyst-like osteolysis of the diaphyseal of the ulna and distal metaphysis of the radius.⁷ The mass and associated periosteum were surgically resected and submitted for histopathologic interpretation. The histologic arrangement of neoplastic cells of that lipoma previously reported in the literature were similar to those seen here, as both were composed of mature adipocytes that compressed and attenuated medullary bone. Interestingly, both lipomas had regions of infiltration of neoplastic adipocytes into the adjacent skeletal muscle.

In people, intraosseous lipomas are radiographically characterized by a sclerotic rim surrounding an osteolytic lesion in the medullary canal of bone.^{10,12–14} The radiographic interpretation of the scapular lesion in this case, as well as that from the only other reported case in the veterinary literature, were similar or identical to the human

radiographic definition of intraosseous lipoma.^{7,10,12–14} On histopathology, these masses are commonly described as densely packed, mature, non-mitotic adipocytes with fine fibrovascular stroma that are locally infiltrative, often without invading vasculature or periosteum.^{7,10,11} In both veterinary cases, imaging findings were correlated with those of similarly described histopathologic interpretations, leading to a diagnosis of intraosseous lipoma.

Primary bone tumors in cats are exceedingly rare, with the most common tumor type being osteosarcoma.¹ The radiographic changes seen with osteosarcoma, including osteolysis, cortical lysis and new bone formation, parallel the radiographic changes observed in this case.^{1,3,15} In addition, the location is commonly appendicular and is often locally invasive without signs of metastasis.¹ Histologically, feline osteosarcoma is described similar to canine osteosarcoma.¹ While both osteosarcoma and intraosseous lipoma originate from bone, the histologic characteristics seen in this patient did not demonstrate any malignant features associated with osteosarcoma, including a lack of osteoblasts, multinucleated giant cells and local invasion into blood vessels.¹

Considering the rarity of feline primary bone tumors, other less common pathologies are poorly characterized. Chondrosarcoma was a strongly considered differential in this case as this tumor type can frequently affect the scapula and is considered the second most common primary bone tumors in cats.^{3,5,16} Much like intraosseous lipomas, chondrosarcomas exhibit slow growth, aggressive local invasion and rarely, if ever, metastasis.⁶ Histologically, they are uniquely characterized by interwoven bundles, sheets and nests of cells within basophilic, chondroid matrix.¹⁶ There was an absence of matrix associated with neoplastic cells in this case, and cells were not spindle shaped or arranged in

bundles. Fibrosarcoma has been described in the literature but arises from fibrous and connective tissue and does not commonly infiltrate into bone.¹

Conclusions

This report highlights the rare diagnosis of intraosseous lipoma in the scapula of a domestic shorthair cat. Following wide surgical excision by means of complete scapulectomy, the patient regained function of the limb and, at the time of writing, has been free of disease for 4 months. Considering the rarity of primary bone tumors in cats, intraosseous lipomas should be considered as a differential diagnosis in future cases with similar signs, history and diagnostic imaging findings.

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

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Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognised high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers) for all procedure(s) undertaken (prospective or retrospective studies). No animals or people are identifiable within this publication, and therefore additional informed consent for publication was not required.

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