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What Is Your Diagnosis?

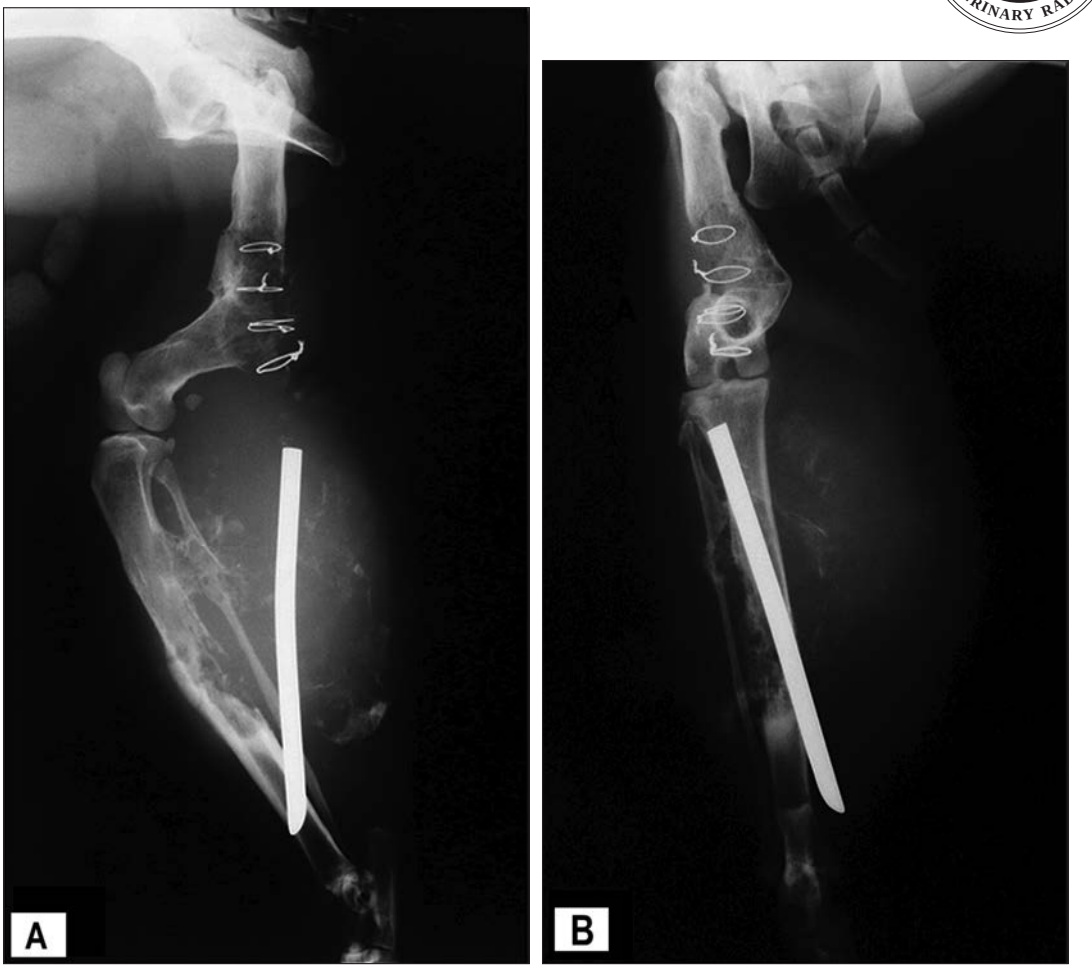

Figure 1—Lateral (A) and craniocaudal (B) radiographic views of the left hind limb of an 8-year-old 3.7-kg (8.1-lb) spayed female domestic shorthair cat that was evaluated because of non–weight-bearing lameness. The cat had a history of a femur fracture of the left femur 4 years earlier. The fracture had been surgically corrected with an intramedullary pin and 4 cerclage wires.

History

An 8-year-old 3.7-kg (8.1-lb) spayed female domestic shorthair cat was evaluated because of non–weight-bearing lameness in the left hind limb. The cat was kept outdoors and had a history of a traumatic fracture of the left femur 4 years before, that was repaired with an intramedullary pin and 4 cerclage wires. The implants were not removed, and no clinical or radiographic recheck evaluations of the left hind limb had been made since surgical repair.

The cat had severe swelling of the caudoproximal aspect of the tibial region; an angular deformity of the distal portion of the femur could be palpated. No other abnormalities were detected on physical examination.

Serologic results for FeLV and FIV testing were negative. Findings on CBC and serum biochemical analysis were unremarkable. The cat was given ketamine (10 mg/kg [4.5 mg/lb], IM) and medetomidine (5 µg/kg [2.3 µg/lb], IM) for sedation, and radiographs of the left hind limb were obtained (**Figure 1**).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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Figure 2—Same radiographic images as in Figure 1. A soft tissue swelling at the level of the caudodistal region of the left hind limb can be seen (arrowheads), along with the metallic intramedullary pin (which has migrated distally) and 4 cerclage wires. Notice the malunion fracture of the femoral diaphysis and poorly defined areas of multifocal osteolysis and periosteal reaction of the femur, tibia, and fibula (arrows).

Radiographic Findings and Interpretation

Severe swelling of soft tissues at the level of the tibia, causing a mass effect, is evident, as is amorphous mineralization. The intramedullary pin has migrated into the caudodistal region of the left hind limb. There is a malunion fracture of the femoral diaphysis; 4 cerclage wires are seen (**Figure 2**). In the region of the malunion fracture, poorly defined areas of osteolysis as well as cortical destruction on the caudal surface of the femur are evident. The tibial and fibular diaphyses also have radiographic signs of multifocal osteolysis and periosteal reactions.

On the basis of radiographic findings, a soft tissue neoplasm with secondary involvement in the femoral, tibial, and fibular diaphyses was suspected, but soft tissue granuloma or abscess with chronic osteomyelitis or metallosis could not be ruled out. Progressive fibrodysplasia ossificans was another differential diagnosis.

Treatment and Outcome

The patient underwent thoracic radiography, which did not reveal any metastatic lesions. Findings on abdominal ultrasonography were unremarkable. Fine-needle aspiration of the mass revealed the presence of ovoid to round mesenchymal cells meeting various criteria of malignancy. Consequently, the cat underwent amputation of the left hind limb at the level of hip joint; the amputated limb was submitted for gross and histologic examination.

Grossly, neoplastic tissue involving the femur, tibia, and fibular diaphyses appeared amorphous and nonencapsulated and had a gray to pink, translucent appearance, containing pockets of mucinous material that escaped from cut surfaces. The gastrocnemius and other major muscles of the medial aspect of the left hind limb were extensively infiltrated. Histologically, the neoplasm consisted of scattered fusiform to stellate cells embedded in a mucinous stroma. Rarely, a multinucleate giant cell was also found interspersed through the stroma. The bulk of the stroma consisted of muci-

nous ground substance that stained prominently with Alcian blue. The neoplasm had infiltrated peripheral tissues extensively, primarily between skeletal muscle fibers, along fascial planes, and along the course of vessels. Bone invasion and necrosis were detected in large areas of the femoral, tibial, and fibular diaphyses. These findings were consistent with a low-grade myxosarcoma, possibly caused by metallic pin migration after implant failure.

The cat recovered from surgery without complication and was discharged from the hospital 3 days later. After 6 months, the cat was doing well. No sign of metastasis was evident on thoracic radiography and abdominal ultrasonography evaluation at 6 months, but the cat was lost to long-term follow-up.

Comments

Myxosarcomas and myxomas are rare tumors of primitive fibroblasts that produce excessive mucin, a myxoid matrix rich in acid mucopolysaccharides. The malignant type tends to be more cellular and better vascularized, with nuclear pleomorphism and mitotic figures.[1] The most common site of myxosarcoma in dogs is skin[2]; there is only 1 report[2] of myxosarcoma in the subcutis in a cat.

In dogs, the heart, liver, omentum, spleen, mouth, brain, eyes, stifle joint, tarsus, carpus, vertebral column, and lungs are reported as other sites of myxosarcoma.[1,2] Findings in 1 study[1] suggest that there is a predilection of this tumor for the orbit of eyes in dogs. The prognosis for myxosarcoma in dogs is poor because of a high rate of local recurrence and metastasis.[2]

The most common tumors that affect the musculoskeletal system in cats are injection-site sarcomas followed by hemangiosarcomas.[3] Tumors may also invade bone from adjacent soft tissue, and these include, most commonly, squamous cell carcinoma.[2] Other than tumors, myositis ossificans and fibrodysplasia ossificans progressiva have been documented to cause bony proliferation and soft tissue swelling.[4]

In the cat of the present report, soft tissue myxosarcoma appeared radiographically as a soft tissue mass in the caudodistal region of the left hind limb. Some amorphous mineralization was evident within the mass. There was multifocal osteolysis and periosteal reactions of the femur, tibia, and fibula. Neoplastic bone invasion was confirmed by histopathologic findings.

To the authors' knowledge, this is the first report of a myxosarcoma in the muscle of a cat, concurrent with metallic implant migration. Soft tissue sarcomas in cats are well documented and are typically vaccine or injection induced but also have developed in association with microchips, surgical sponges, and a subcutaneous fluid port.[5] Furthermore, osteosarcomas associated with internal fixation devices to correct limb fracture are described for cats.[6] In cats, there is a causal relationship between chronic inflammation and development of sarcomas, but malignant transformation can be correlated also to longstanding presence of a foreign body.[5]

The cat of the present report was kept outdoors and was not followed clinically or radiographically following initial repair of the left femoral fracture. It is possible that, during the 4 years after surgery, the migration of the implant in the muscle, due to instability at the fracture site, could have caused chronic tissue reaction, which contributed to carcinogenesis. Long-term follow-up of fracture healing and the removal of an implant after a fracture failure should be recommended to reduce the likelihood of sarcoma development in cats.[6]

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