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What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

History

A 5-year-old 3.1-kg spayed female domestic longhair cat was referred for fracture repair of the right tibia and fibula. The cat was presented to the referring veterinarian because of right hind limb lameness for 1 week with no history of trauma. The referring veterinarian performed 2-view radiography of the right hind limb with the pelvis included in the lateral view (not shown) and identified fractures in the proximal aspects of the right tibia and fibula, increased medullary opacity, and degenerative changes of the right stifle and hip joints. Following the application of a splint and administration of analgesics, the cat was referred for fracture repair.

On referral examination, the cat had vital signs within reference limits. The splint on the right hind limb was appropriately positioned, and there was bilateral crepitus on extension of the hip joints, with the right hip joint more affected than the left. The owner reported that the cat was housed exclusively indoors in Massachusetts and had a history of mild, chronic hind limb lameness and a refusal to jump onto high surfaces. All of the cat's teeth had been extracted the year before because of chronic dental disease, and records of the dental surgery were not available.

Point-of-care blood work revealed mild anemia (PCV, 27%; reference range, 30% to 45%), and the cat tested negative for FIV and FeLV. Two-view right hind limb radiography was performed **(Figure 1)**.

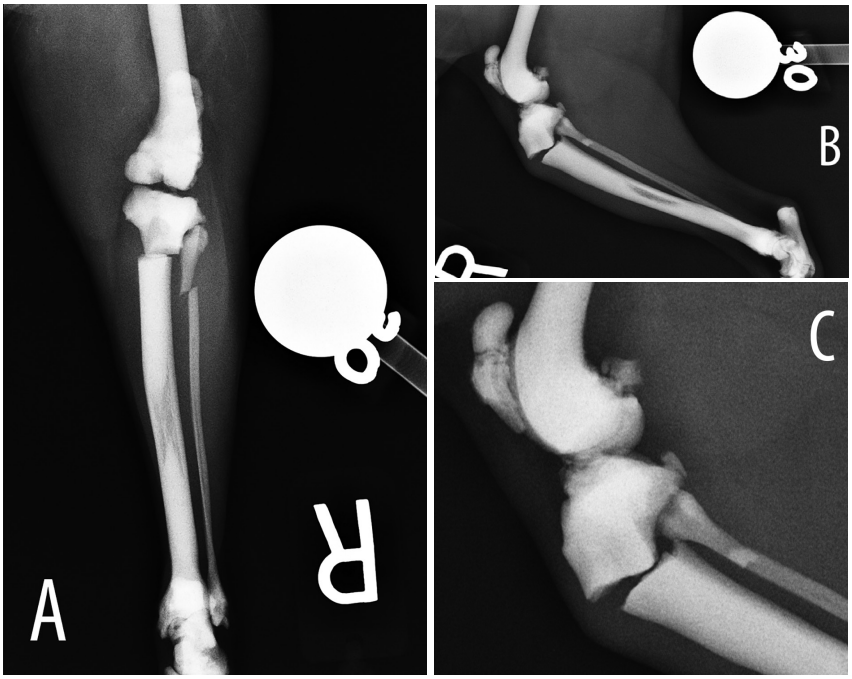

Figure 1—Craniocaudal (A) and lateral (B) radiographic images of the right hind limb and a close-up lateral radiographic image of the right stifle joint (C) of a 5-year-old 3.1-kg spayed female domestic longhair cat with no history of trauma but referred for fracture repair of the right tibia and fibula.

Formulate differential diagnoses, then continue reading.

Radiographic Findings and Interpretation

There are complete transverse fractures of the proximal diaphyses of the right tibia and fibula **(Figure 2)**. The distal fragment of the tibia was displaced medially, caudally, and slightly proximally. The distal fibular fragment was displaced laterally and proximally. There was a complete transverse fracture of the right patella with remodeling of the fracture margins, indicating chronicity. There was the impression of a fracture of the base of the calcaneus with proximal angulation of the distal fragment, though its proximity to the edge of the radiograph made it difficult to fully assess. Marked diffuse increased medullary opacity of all imaged bones was noted; however, some medullary lucency was seen at the midlevel of the tibial diaphysis.

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Irregular periarticular new bone formation with well-defined margins was noted at the patellar apex, fabellae, lateral femoral epicondyle, tibial plateau, and lateral tibial condyle, and consistant with mild to moderate degenerative joint disease of the right stifle joint.

The combination of chronic patellar fracture with subsequent acute tibial and fibular fractures and potential calcaneal fracture was most compatible with feline patellar fracture and dental anomaly syndrome (PADS). The fractures were considered most likely stress fractures, with trauma being a less likely differential diagnosis. Our differential diagnoses for increased bone density without changes in bone shape included feline PADS, osteopetrosis, less likely paraneoplastic changes (eg, secondary to lymphoblastic leukemia, lymphoma, or C-cell tumor), and much less likely FeLV medullary osteosclerosis or chronic bisphosphonate treatment (given the negative ELISA test results for FeLV and lack of any known medications prior to the fractures).

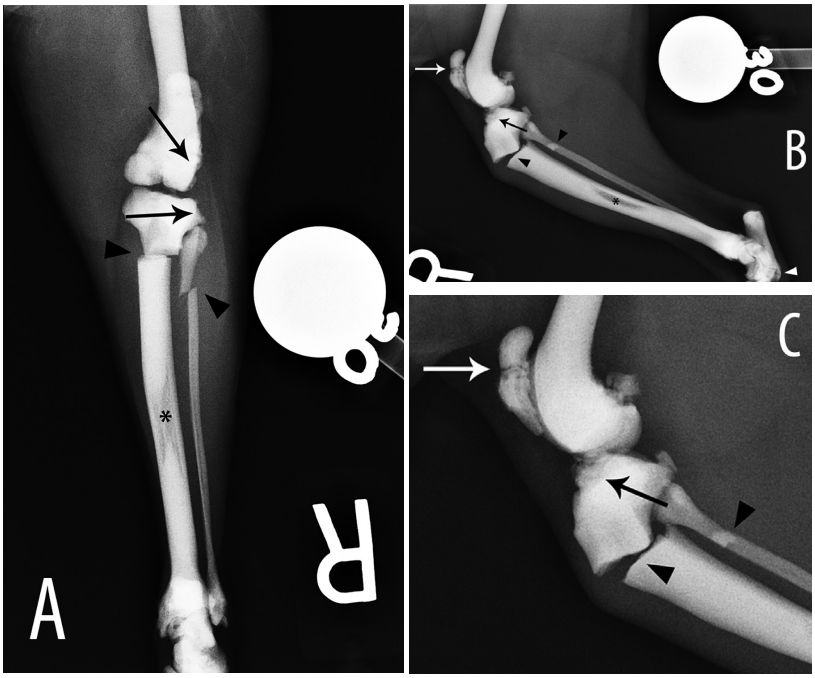

Figure 2—Same images as in Figure 1. There are tibial and fibular fractures (black arrowheads), a fracture of the patella with remodeling of the fracture margins indicative of chronicity (white arrows), and a potential calcaneal fracture (white arrowhead). The bones have generalized increased opacity, and the only visible medullary cavity is at the mid-diaphysis of the tibia (asterisks). Well-defined, irregular, periarticular new bone formation (black arrows) is evident on bones of the stifle joint.

Treatment and Outcome

The cat underwent surgery to reduce the tibial fracture. The patellar, fibular, and suspected calcaneal fractures were not addressed. On initial postoperative radiographic images **(Figure 3)**, good reduction of the tibial fracture was seen; however, an acute fracture of the tibial tuberosity created during surgery was noted; therefore, the cat was taken back to the operating room for placement of a pin and tension band to secure the tibial tuberosity. The cat was discharged several days later with prescriptions of meloxicam (0.3 mg, PO, q 24 h for 3 days) and amoxicillin–clavulanic acid (43 mg; PO, q 12 h for 10 days).

On recheck radiographic examination 9 weeks after surgery, stable implants and mild remodeling of the tibial fracture sites were noted. The patellar fracture and increased medullary opacity exhibited no changes from the radiographic examination performed during the referral evaluation. The cat was doing well at home, and no further treatments were indicated.

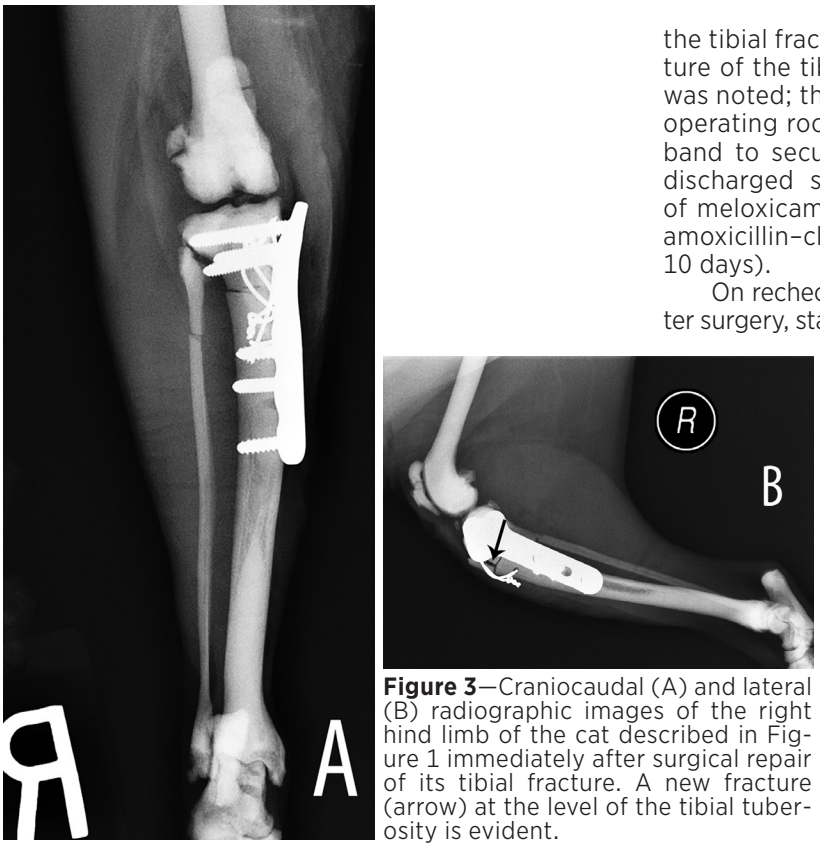

Figure 3—Craniocaudal (A) and lateral (B) radiographic images of the right hind limb of the cat described in Figure 1 immediately after surgical repair of its tibial fracture. A new fracture (arrow) at the level of the tibial tuberosity is evident.

Comments

The diagnosis of the underlying cause of, and subsequent repair of, the tibial fracture depended on radiographic findings. Although it was reasonable to have suspected acute trauma for such a fracture, the increased medullary opacity and patellar fracture did not support this differential diagnosis. If the

radiographic beam had been tightly collimated to the tibia, the diagnosis of PADS may not have been made. The inclusion of PADS as a differential diagnosis is critical to provide owners with realistic prognoses for future fractures and to suggest further imaging to screen for dental anomalies.

Patellar fracture and dental anomaly syndrome is a rare condition with an unknown etiology. Previously, it was reported as feline knees and teeth syndrome.[1] Current evidence suggests a heritable component; it is hypothesized that affected cats have a metabolic defect that makes their bones more prone to fracture.[2,3] Patellar fractures are generally diagnosed in affected cats between the ages of 1 and 3 years.[1] Classic findings include transverse patellar stress fractures (bilateral in 73% [57/78] of affected animals) and retained or persistent deciduous teeth.[1–5] In a previous study, nonpatellar stress fractures were documented before and after patellar fracture in approximately 41% (78/191)[3] of affected animals. The mean age of affected cats examined because of fractures was 5.5 years.[3] Approximately 12% (9/78) of affected cats also had a focal or generalized increase in skeletal opacity.[3]

Generally, patellar fracture begins unilaterally, with the second patella fracturing within 3 to 9 months later.[1,3] Such patella fractures are often successfully managed medically, and attempts to use pins or wires to reconnect the fragments have often resulted in additional fragments.[1] In the previous study,[3] 78 cats had additional nonpatellar fractures, and 43 (55%) of those cats had > 1 fracture. Common fracture sites include but are not limited to the acetabulum, proximal tibia, ischium, humeral condyle, and base of the calcaneus.[4] Radiographically, the fractures have an appearance compatible with stress fractures, including single transverse or oblique fracture lines with surrounding sclerotic bone.[3,4]

In the previous study,[3] approximately half (92/191) of cats with PEDS had dental anomalies. The potential findings are diverse and include persistent deciduous teeth, marked periosteal proliferation, tooth root resorption, and other malformations of the jaw and teeth.[1,5] These changes can be radiographically aggressive and may be mistaken for neoplasia. Early data suggest that symptomatic treatment through tooth extraction and debridement of abnormal bone are required for improved outcomes.[5] For the cat of the present report, CT of the head would have been useful for evaluating potential abnormalities; however, the owners declined.

Radiographic and clinical findings alone are sufficient to diagnose PADS; however, CT can be helpful for planning surgical and dental correction.[5] Although dental abnormalities of the cat of the present report were unknown, the remaining signs were sufficient to support a diagnosis of PADS. Mild anemia in this cat could have been attributable to the reduced size of the medullary cavities of its bones and thus decreased erythropoietic capabilities of the bone marrow. Findings for this cat highlighted the importance of examining all visible portions of radiographic images because the chronic patellar fracture and increased medullary opacity were not obviously related to the presenting complaint yet were essential to obtaining a diagnosis. Additionally, familiarity with this rare disease helps direct other diagnostic procedures, such as recommending CT of the head. Although not shown in the present report, both limbs should be imaged if this condition is suspected because patellar fractures in PADS are often bilateral, as previously mentioned. Additionally, the owner should also be warned of the potential for subsequent fractures. Furthermore, the multiple fractures of different ages that can be seen in patients with PADS should not be mistaken for abusive treatment.

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