Osteolysis of the radius and ulna induced by a circumferential foreign body in a cat

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Case Description—A 1-year-old neutered male cat was examined because of a 6-month history of recurrent swelling and draining wounds affecting the craniomedial aspect of the distal portion of the left forelimb.

Clinical Findings—No lameness or neurologic deficits were evident. Examination of craniocaudal and lateromedial radiographic views revealed nonprogressive circumferential osteolysis and a mildly radiopaque, ring-shaped foreign body surrounding the radius and ulna.

Treatment and Outcome—During surgery, a tight elastic band surrounded by a thick fibrous tissue capsule was found encircling the limb. Microbial culture yielded a Staphylococcus aureus sp that was susceptible to clindamycin. Follow-up monitoring via telephone communication with the owners 1.5 years after removal of the foreign body indicated that the cat had healed with no recurrence of drainage.

Clinical Relevance—Pressure osteolysis of the bones of the forelimb can be caused by a circumferential foreign body without associated neurologic abnormalities or lameness.


A 1-year-old neutered male domestic shorthair cat was examined by the surgical service at our veterinary medical teaching hospital because of a 6-month history of recurrent swelling and draining wounds of the distal aspect of the left forelimb. The cat had been acquired as a stray, and the condition was evident at the time the cat was acquired.

The cat was initially evaluated by a referring veterinarian because of a swollen left forelimb with a small wound with purulent material along the medial aspect of the distal third of the radius. Orbifloxacin (2.2 mg/kg [1 mg/lb], PO, q 24 h) was prescribed for 3 weeks. Six weeks later, the limb was less swollen and the wound along the medial aspect was healing, but a draining tract was evident along the lateral aspect of the limb. Surgical exploration of the swelling was suggested, but the owners elected to continue conservative treatment. Clavamox (12.9 mg/kg [5.9 mg/lb], PO, q 12 h) was prescribed for 4 weeks. Swelling and purulent drainage were still evident during reevaluation 2 weeks later. Examination of radiographs obtained during the reevaluation revealed osteolysis in the distal aspect of the left radius and ulna.

Samples were collected from the draining tract for culture and susceptibility testing, which yielded Staphylococcus aureus that was resistant to amoxicillin. Clindamycin (10 mg/kg [4.5 mg/lb], PO, q 12 h) was prescribed for 6 weeks. Five weeks later, swelling of the limb had decreased and no drainage was evident, but examination of repeat radiographs revealed no progression of the bony lesions. Referral was recommended because of the recurrent nature of the draining tract when antimicrobials were discontinued and the lack of improvement of the bony lesions.

Four weeks later, the cat was examined at our veterinary medical teaching hospital. During our initial examination, the cat was alert and had normal mentation. A soft fluctuant swelling was evident along the cranial aspect of the distal third of the left radius, but there was no evidence of a fistulous tract. There was no evidence of discomfort during palpation of the limb, and the cat was not lame. A CBC and serum biochemical analysis did not reveal abnormal findings. Cranio-caudal and latero-medial radiographic views of the left forelimb revealed a circumferential pattern of osteolysis affecting primarily the lateral and caudal cortex of the ulna and the medial cortex of the radius with minimal periosteal reaction. A circular opacity was evident within the soft tissues and surrounding the radius and ulna circumferentially; this was suggestive of a circular, circumferential foreign body (Figure 1). No progression of bony lysis was visible, compared with results of radiographs obtained by the referring veterinarian 9 and 4 weeks before our initial examination.

Surgical exploration for removal of a suspected foreign body, debridement, and collection of samples for microbial culture was recommended. The cat was anesthetized with isoflurane, and the left forelimb was clipped and prepared for aseptic surgery. Clipping revealed a circumferential scar at the center of the soft tissue swelling along the distal aspect of the radius and ulna (Figure 2).

A craniomedial skin incision was made along the distal third of the left radius. A subcutaneous
Pocket of purulent material surrounded by thick fibrous tissue was identified. A foreign body (a tight elastic band) was found within the center of the purulent material. The band was severed to ease tension and allow removal (Figure 3). Tissue samples were collected from the fibrous tract and submitted for aerobic and anaerobic culture and susceptibility testing. Cefazolin (22 mg/kg [10 mg/lb], IV) was administered after tissue samples were collected. The surgical site was debrided and lavaged with warm sterile saline (0.9% NaCl) solution. The purulent material appeared to be contained within the thick fibrous tissue capsule that had formed around the elastic band, and the radius and ulna were not visible or palpable. In an effort to prevent further contamination, the surgeon decided not to explore deeper layers of tissues.

To allow postoperative drainage of this infected cavity, a small closed-suction drain system was constructed by removing the syringe adapter of a 19-gauge butterfly catheter. The tubing was fenestrated and placed circumferentially along the entire fibrous tract; the tubing exited the skin through a separate stab incision. The needle end of the butterfly catheter was attached to a 2-mL vacuum serum tube to create a small closed-suction drain system. The subcutaneous tissue layer was closed over the drain by use of an interrupted pattern and a continuous pattern of 3-0 and 4-0 monofilament glycomer 631, respectively. The skin was closed in a cruciate pattern by use of 4-0 monofilament polypropylene. A soft padded bandage was placed on the limb to hold and protect the drain and serum tube. Hydromorphone (0.05 mg/kg [0.023 mg/lb], SC) was administered as required after surgery. No fluid was aspirated from the closed-suction drain, and because the cat did not tolerate the bandage or wearing of an Elizabethan collar, the bandage and the drain were removed a few hours after surgery.

The day after surgery, the cat used the limb well with no visible lameness. Minimal swelling of the surgical site was still evident. The cat was discharged to the owners with instructions for administration of meloxicam (0.1 mg/kg [0.045 mg/lb], PO, q 24 h for 3 days) and clindamycin (10.3 mg/kg [4.7 mg/lb], PO, q 12 h for 7 days) pending results of culture and susceptibility testing. Aerobic bacterial culture yielded *S. aureus*; no anaerobes were isolated. Clindamycin was prescribed for an additional 3 weeks.

Radiographic reexamination was recommended 4 to 6 weeks after surgery to assess progression of the bony lesions and determine whether antimicrobial treatment should be continued. However, the cat was not returned to our veterinary teaching hospital for reevaluation. Telephone communications with the referring veterinarian and owners 1.5 years after foreign body removal revealed that the cat had received a 4-week course of antimicrobials after surgery and recovered uneventfully without recurrence of a draining tract.
Osteomyelitis is a recognized condition in veterinary medicine and is defined as an inflammation of the bone marrow, cortex, and periosteum attributable to an infection. Bacterial infection is the most common cause of osteomyelitis, but other causes include fungi, parasites, viruses, and corrosion from metallic implants. Bacteria most frequently associated with osteomyelitis are *Staphylococcus* spp, *Streptococcus* spp, and gram-negative aerobic bacteria. Infection may result from direct inoculation of organisms into the bone following trauma or surgery, direct extension from an adjacent soft tissue infection, or hematogenous spread. Osteomyelitis secondary to a foreign body has also been reported as a cause of osteomyelitis in dogs but not in cats.

Clinical signs of osteomyelitis include warmth, redness, localized pain that can cause lameness, soft tissue swelling, and draining tracts. Soft tissue swelling, osteolysis, bone sequestration, irregular periosteal reaction, and increased medullary opacity are typical radiographic findings; however, those changes can take several weeks to become visible. When radiographic signs are equivocal, scintigraphy can be used to detect increased blood flow to the suspicious area of the bone. Fistulography of draining tracts may be helpful to delineate a foreign body and to confirm whether the draining tract communicates with the bone lesions. Histologic examination of bone biopsy specimens can provide a diagnosis of osteomyelitis, but culture of samples obtained from deep wounds is often necessary to identify the causative agent.

In the cat reported here, a presumptive diagnosis of osteomyelitis had been made prior to referral on the basis of radiographic bony lysis and culture of *S aureus* from the soft tissues. Because samples of bone were not submitted for microbial culture or histologic examination, the authors cannot confirm whether there actually was osteomyelitis. However, radiographic abnormalities did not support osteomyelitis. Axial displacement of the cortex was evident radiographically, rather than a true loss of bony cortex. The periosteal reaction was smooth, and the zone of transition was sharp and distinctly short with no disruption of medullary markings adjacent to the contracted area. Finally, progression of the bony lesions was not detected radiographically during a period of at least 9 weeks. Fistulography was not performed in this cat because the fistulous tract had resolved with antimicrobial treatment.

Radiographic findings supported the contention that bony remodeling developed secondary to the pressure caused by the elastic band on the tissues surrounding the bones. This was also supported by the fact that there had been infection of the soft tissues for approximately 6 months and that it was localized to the fibrous capsule surrounding the foreign body at the time of surgery. Finally, the cat never displayed signs of pain or lameness, which often accompany osteomyelitis in dogs and cats, and did not develop additional clinical signs despite only receiving a 4-week course of antimicrobials after removal of the foreign body.

Osteolysis secondary to the application of soft tissue pressure over a bone has been detected as early as 5 days after application of pressure in research animals. Suspected pressure-induced atrophy of vertebral bone has also been reported in dogs with benign tumors invading the spinal canal. Osteolysis does not reportedly cause lameness or pain, whereas unstable implants or bone infection is generally associated with lameness. Interestingly, the elastic band caused a circumferential cutaneous scar and circumferential bony resorption. In humans and other animals, osteolysis is most commonly associated with joint replacement surgery in which implant motion and wear particles cause bony inflammation and lysis. Pressure osteolysis has also been reported secondary to tumor growth and pressure caused by implants, such as lateral sutures for stabilization of the stifle joint. Osteolysis is also commonly associated with dental disease and neoplastic lesions. To our knowledge, pressure osteolysis caused by a foreign body that is not a surgical implant has not been reported in dogs and cats.

**Figure 3**—Photograph obtained during surgery to explore a swelling along the distal aspect of the left forelimb in a 1-year-old cat with a 6-month history of recurrent swelling and draining tracts. Surgical exploration revealed a tight circumferential foreign body (green elastic band) surrounded by thick fibrous tissue located within the subcutaneous tissues. The band was severed with a scalpel blade and removed. Communication of the fibrous tissue capsule and bone was not detected during surgery.

**Discussion**

Osteolysis refers to a process in which there is bone resorption. In humans and other animals, osteolysis is most commonly associated with joint replacement surgery in which implant motion and wear particles cause bony inflammation and lysis. Pressure osteolysis has also been reported secondary to tumor growth and pressure caused by implants. Osteolysis is also commonly associated with dental disease and neoplastic lesions. To our knowledge, pressure osteolysis caused by a foreign body that is not a surgical implant has not been reported in dogs and cats.

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lysis but did not ultimately compromise blood flow or nerve function to the distal aspect of the limb. Given the surgical findings, it appears that the elastic band was tight enough to penetrate the skin but loose enough to prevent penetration beyond the subcutaneous tissues, which spared the nerves, vessels, and muscles. Although the soft tissues appear to have tolerated the increased circumferential pressure, the bony remodeling likely developed as a result of bone adaptation to increased pressure. In turn, this likely reduced the soft tissue pressure and spared the nerves and vessels. Ultimately, the only clinical sign evident in the cat during the course of 6 months was soft tissue swelling and recurrent draining tracts.

Acute osteomyelitis is typically responsive to appropriate antimicrobial treatment. However, chronic osteomyelitis may require surgical debridement of necrotic tissue, lavage, bone grafting, and possibly stabilization. Prolonged antimicrobial treatment, typically for a minimum of 6 to 8 weeks, appears necessary to achieve full clinical and radiologic recovery, with some patients requiring a longer duration of treatment. In the cat reported here, osteomyelitis was considered unlikely, but antimicrobials were prescribed because of the long-standing soft tissue infection. Although the foreign body was removed, a potential for persistent infection and recurrent swelling or draining tracts was discussed with the owners. On the basis of follow-up monitoring via telephone communications with the owners, recurrence was not evident in this cat. The cat did not return for radiographic reexamination of the bony lesion because of financial concerns and lack of recurrent signs. The aforementioned surgical findings, combined with the lack of recurrence of a draining tract or other clinical signs after only 4 weeks of antimicrobial treatment after surgery, supports the diagnosis of osteomyelitis rather than osteomyelitis in this cat.

Interestingly, the elastic band foreign body in this cat was visible radiographically. Although the elastic band was visible circumferentially around the bones, it was most obvious in an end-on view because the summation of the elastic along its length resulted in increased radiopacity. This was unusual because most foreign bodies, such as sticks and porcupine quills, have a radiographic opacity similar to that of soft tissues and foreign bodies, such as surgical sutures and porcupine quills, are not typically visible on survey radiographs. Recurrence of signs. The aforementioned surgical findings, combined with the lack of recurrence of a draining tract or other clinical signs after only 4 weeks of antimicrobial treatment after surgery, supports the diagnosis of osteomyelitis rather than osteomyelitis in this cat.

References