Steroid Injection Therapy in a Feline Solitary Bone Cyst

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ABSTRACT. A nine months old Japanese domestic cat with a solitary bone cyst, which is a benign tumor-like lesion and is particularly uncommon in feline practice was referred. Radiographic examination revealed an expansile radiolucency in the distal metaphysis of the right ulna and pathologic fracture. The histological examination demonstrated immature osteogenesis consisting of osteoblasts surrounded by connective tissue. We applied drainage and instillation of steroid solution into the cystic cavity. Clinical signs, including lameness and pain, disappeared three weeks after the therapy started. Fourteen months after the therapy, the cystic lesion of bone was remodeling successfully without re-developing. We conclude that our procedure was useful treatment in this case.

KEY WORDS: feline, solitary bone cyst, treatment.

A 9-month-old male Japanese domestic cat, weighing 4.1 kg, was referred to the University of Kagoshima Veterinary Teaching Hospital for evaluation of a massive lesion on the right forelimb with a recurrent lameness. He had been treated with anti-inflammatory drugs and analgetics before one month of the referral.

The physical examination revealed a swelling in the right distal of antebrachium, which was excessively painful on palpation. A survey radiographic examination revealed an expansile radiolucency (1.5 × 2.0 cm) in the distal metaphysis of the right ulna, which was marginated by a thinner bone cortex with no visible irregular periosteal reaction (Fig. 1). Also, a pathological fracture was seen in the cortical area. Biopsy of the lesion was performed under sedation (medetomidine, 40 µg/kg sc) and local anesthesia around the right carpus. Following surgical preparation, the fluids and inner wall in the cystic lesion were obtained according to a routine needle-aspiration method. We got a 1.0 ml of viscous, serous and yellowish fluid, which was analyzed biochemically, bacteriologically, and cytologically. As well, the small tissue-pieces were evaluated microscopically. After the needle-aspiration, the right carpal joint was placed in a cast to prevent propagation of pathologic fracture.

The alkaline phosphatase (ALP) value of the fluid was 821 IU/L, while the serum ALP (53 IU/L) of this patient was within the reference range (10 to 80 IU/L). Fluid cultures yielded no bacterial growth, and any oncocytes and giant cells were never seen in the smear specimen. The histological examination of the inner wall specimen demonstrated immature osteogenesis consisting of osteoblasts surrounded by connective tissue (Fig. 2). A few new vessels and osteoclasts were observed, whereas any giant cells and anaplastic mesenchymal cells were never seen in the tissue. On the basis of radiology, histopathology, and laboratory data, a definitive diagnosis of solitary bone cyst was made. To promote bone healing, repeated drainage and steroid injection to the cavity was applied every three weeks rather than autogenous bone grafting recommended previously in small animal surgery [8].

The treatment was performed two weeks after the referral, under the same sedation and local anesthesia as in needle-biopsy. A twenty-three gauge of injection-needle was percutaneously inserted to the cystic cavity, and a 1.0 ml of filling fluid was aspirated completely. And then, a 0.5 ml solution containing 20 mg of methylprednisolone acetate was injected. After the procedures, the right carpus joint was placed in a cast again.

Three weeks after the first intervention, the cast was removed because improvement of lameness and healing of pathologic fracture were determined clinically and radiographically. The ALP level (>1500 IU/L) of the aspirated fluid was higher than serum (61 IU/L). At six weeks, radiographic examination revealed that the radiolucent area of the cystic lesion slightly decreased, which suggested osteogenesis starting. At nine weeks, remodeling of the cyst was advancing, and then the cortex of lesion was getting so hard.
to penetrate it with needle. The ALP values in the fluid (0.8 mL) and the serum were 720 IU/L and <51 IU/L, respectively. At 12 weeks, the radiolucent area of the cystic lesion decreased further more. Since it was impossible to penetrate the lesion with the needle, we discontinued the drainage and steroid injection. Subsequently, the cat had been followed up radiographically every month for 14 months. Four months after the therapy stopped, the cystic radiolucent area reduced significantly and the definite remodeling was revealed (Fig. 3). The degraded bone was healed successfully without developing again until 14 months (Fig. 3), and then the cat has never presented any clinical signs associated with the bone cyst.

Solitary bone cyst, which is classified in a benign tumor-like lesion of bone simulating primary tumors, is uncommon in feline practice [2, 8]. To our knowledge, there were no case reports on solitary bone cyst in feline practice. Although several theories include infection, intraosseous vascular abnormalities, local alteration of bone metabolism or trauma, have been suggested, the cause is still unclear in both human and veterinary medicine [5, 11]. Solitary bone cysts generally occur at the metaphysis or diaphysis of the long bone in dogs younger than one year and patients have no clinical signs or mild lameness and joint swelling if a pathological fracture have not occurred [8]. In this case, the cyst occurred at the metaphysis of ulna in a 9-month-old cat, was accompanied by pain, swelling, and lameness associated with pathological fracture. The radiographic findings, including radiolucent defect with cortical thinning and osseous expansion, which are essential for the diagnosis, were consistent with previous reports in canine practice [2, 8, 16]. Furthermore, the pathology and bacteriology of fluid and tissue obtained by biopsy demonstrated no features indicating primary bone neoplasia of the osteogenic series, other primary bone neoplasia (hemangiosarcoma or giant cell tumor), metastatic bone neoplasia, bone abscess, or aneurysmal bone cyst.

It has been suggested that differences of ALP and acid phosphatase (ACP) levels between filling fluid in the cystic cavity and serum are useful for diagnosing bone cysts in human medicine [10]. In this case, the ALP value in cyst was also continuously high level in spite of the normal range of serum value. The fluid should be able to obtain from the cystic lesion even if it is too hard for small animal to get the inner tissue enough to examine. Therefore, the difference of ALP values between the filling fluid in the cyst and serum will be a helpful parameter to discriminate solitary bone cysts in animals.

The prognosis is favorable if the cyst or pathological fracture does not interfere with normal growth in canine practice [8], while there is a human data showing that 85% of solitary bone cysts persisted and enlarged in childhood without treatment during childhood [6, 7]. Surgical methods including drainage using multiple drill holes, curettage and autogenous grafting have been generally recommended to treat solitary bone cyst in canine practice [8]. On the other hand, it was suggested in human medicine that these procedure could be accompanied by several complications such as infection, iatrogenic fracture, growth plate injury, and general disability from prolonged immobilization, which were followed by disturbance of limb growing, damage to surrounding soft tissues, and osteomyelitis [1, 12]. Then, to promote bone reconstruction without such complications, more radical treatments including drainage and steroid
injection [13], autologous bone marrow injection [17], and hydroxyapatite packing [9] into the cystic cavity, have been introduced. In particular, steroid instillation therapy has been previously believed to associate with less complications and recurrences than bone grafting [1, 11, 12]. Although Shindell et al. suggested that steroid could interrupt an intercellular prostaglandin E2 mediated cycle of osteoclast [15], the mechanism of the effect has been remained unclear. Scaglietti et al. [14] and Capanna et al. [3] reported 90% and 80% of success in human patients cared by the procedure, respectively. According to such reports, we applied drainage and steroid injection to the cat rather than bone grafting. As the procedure repeated every three weeks, radiopacity of cortex increased and cystic radiolucency was decreased gradually, that suggested development of osteogenesis. In human, it has been previously shown that various frequencies (every 2–3 months) and periods (for 6–14 months) of the steroid therapy are necessary to complete sufficient bone healing [4, 11, 12]. In our case, after 12 weeks of treatment, the cortical wall was so stiff not to be penetrated with needle and then the treatment was discontinued to avoid bone injury. The degraded bone was uneventfully reconstructed after 14 months. We conclude that steroid injection into the cystic cavity following drainage was useful for treatment of solitary bone cyst with less iatrogenic complications in the present case.

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REFERENCES