Radiographic evidence of degenerative joint disease in geriatric cats: 100 cases (1994–1997)

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Objective—To determine prevalence of radiographic evidence of degenerative joint disease (DJD) in geriatric cats.

Design—Retrospective study.

Population—100 cats > 12 years of age.

Procedure—One investigator reviewed radiographs and for each articulation (or group of articulations) that was visible assigned a grade of severity (0, 1, 2, 3) for DJD. Another investigator reviewed medical records and recorded signalment, environment, previous disease, diseases evident at time of radiography, FeLV vaccination and infection status, feline immunodeficiency virus serologic status, serum creatinine concentration, serum globulin concentration, and any other important findings. Associations between DJD of grade 2 or 3 and variables recorded from the medical record were determined.

Results—Radiographic evidence of DJD was evident in 90% of cats. Neurologic disease was associated with lesions in the lumbosacral portion of the vertebral column. Severe lesions were found in 17% of the elbow joints, but an underlying cause was not determined.

Conclusions and Clinical Relevance—Degenerative joint disease was detected radiographically in most geriatric cats and may be an overlooked cause of clinical disease. Clinicians should be alert to the possibility that DJD is associated with neurologic signs. (*J Am Vet Med Assoc* 2002;220:628–632)

Degenerative joint disease (DJD) is commonly recognized in geriatric dogs and is an accepted cause of chronic pain.[1] Because many cats now have an extended lifespan, there is a need to characterize the prevalence, causes of, and clinical signs associated with DJD in cats. Cats, being light and agile, can compensate for fairly severe orthopedic disease.[1,2] They are notorious for hiding signs of lameness in the veterinarian's office. As reported by owners, clinical signs of chronic pain at home are often those of attitude (eg, grumpy, slowing down) and disability (cannot groom well, misses the litter box on occasion, cannot jump on counter), rather than obvious signs of lameness.[1,2] The purpose of the study reported here was to determine the prevalence of radiographic evidence of DJD in geriatric cats.

Criteria for Selection of Cases

Records and radiographs were obtained for 129 cats referred consecutively to the radiology service at North Carolina State University Veterinary Teaching Hospital from November 1994 to February 1997. Cases qualified for the study if the cat was > 12 years of age, had a complete medical record, had been radiographed as part of the diagnostic workup, and did not have a diagnosis of acute inflammatory polyarthritis. From 129 records, 28 cases were excluded because of an incomplete medical or radiographic record, and 1 case was excluded because of a primary diagnosis of acute inflammatory polyarthritis.

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Procedures

The remaining 100 cases were allocated between 2 investigators. One investigator reviewed the radiographs, and a grade for DJD was assigned for each articulation (or group of articulations) that was visible. The primary joints of the limbs were evaluated individually. The feet, if visible on the radiograph, were considered 1 location. The vertebral column was divided into thoracic, lumbar, and lumbosacral regions. The articulations of the sternum were grouped. A grade of 0 to 3 was assigned on the basis of the presence and severity of radiographic features consistent with DJD.[3] Radiograph quality was rarely sufficient to allow assessment of effusion or soft-tissue swelling or thickening around a joint. Periarticular new bone formation was classified as either enthesophytes or osteophytes, depending on location and association with ligamentous or capsular attachments. Subchondral sclerosis, remodeling of articular surfaces, and perichondral bone erosion were considered features of more severe joint degeneration. If intracapsular, capsular, or extra-articular mineralization was evident in association with the joint, its location and extent influenced the assigned grade.

A grade of 0 was given if the joint appeared normal. A grade of 1 was given if there were small enthesophytes or small osteophytes, indicated by slight roughening of the periarticular margins. If enthesophytes or osteophytes were obvious but joint structure was minimally affected, a grade of 2 was assigned. Slight subchondral sclerosis and a small number of mineralized joint bodies would be consistent with this grade. For the vertebral column regions, > 1 intervertebral space was required to have this degree of change for the region to receive a grade of 2. More severe degeneration, as evidenced by extensive peri- and intra-articular mineralization, severe subchondral sclerosis, and joint remodeling, received a grade of 3.

The other investigator reviewed the medical records and recorded the following information: signalment, environment, previous disease, skin disease, urinary tract disease, heart disease, ocular disease, digestive tract disease, FeLV vaccination and infection status, **feline immunodeficiency virus (FIV)** serologic status, serum creatinine concentration, serum globulin

concentration, and any other important findings. The data were tabulated and sorted in 2 ways: cats with any vertebral column region visible in the radiographs were sorted into cats with DJD grades of 0 or 1 and cats with grades of 2 or 3. A Fisher exact test was used to examine the association between cats in each group and the other variables. Cats with any appendicular joint area visible were sorted into cats with DJD grades of 0 or 1 and cats with grades of 2 or 3. A Fisher exact test was used to examine the association between cats in each group and the other variables.

Results

The 100 cats had a mean ± SD age of 15.2 ± 1.9 years. One cat was a sexually intact male, 51 were castrated males, 1 was a sexually intact female, and 47 were spayed females. There were 68 domestic shorthairs, 17 domestic longhairs, 6 Siamese, 3 Himalayans, 3 Persians, 1 Maine Coon, 1 Manx, and 1 Abyssinian. Dental disease was recorded in medical records of 12 cats, hyperthyroidism in 17 cats, cancer in 49 cats, diabetes mellitus in 6 cats, urinary tract disease in 30 cats, cardiovascular disease in 49 cats, ocular disease in 15 cats, skin disease in 14 cats, digestive tract disease in 27 cats, and neurologic disease in 7 cats. Serum creatinine concentration was > 2.3 mg/dl in 19 of 96 cats for which the variable was measured. Outdoor exposure was reported in 46 of 92 cats for which the variable was recorded.

The vertebral column was visible on all 100 radiographs. At least 1 appendicular joint was visible on 99 radiographs. The most consistently viewed sites were the thoracic vertebral column (96 cats), shoulder joint (93), sternum (92), and elbow joint (71). Less consistently viewed sites were the lumbar vertebral column (30 cats), lumbosacral vertebral column (18), hip joint (18), and stifle joint (13). The carpus, hock joint, and feet were each seen in ≤ 2 cats. Of the 100 cats, only 10 cats had no radiographic signs of DJD. Twenty-six cats had DJD in the vertebral column only, 10 cats had DJD in the appendicular joints only, and 54 cats had DJD in the vertebral column and appendicular joints.

When the cats were sorted for severity of DJD, 58 had DJD of the vertebral column of grades of 0 or 1, and 42 had grades of 2 or 3 (**Fig 1 and 2**). Eighty-four cats had DJD of appendicular joints of grades of 0 or 1, and 15 cats had grades of 2 or 3 (**Fig 3 and 4**). The most severely affected appendicular joint was the elbow; 12 of 71 (17%) elbow joints were graded 2 or 3,

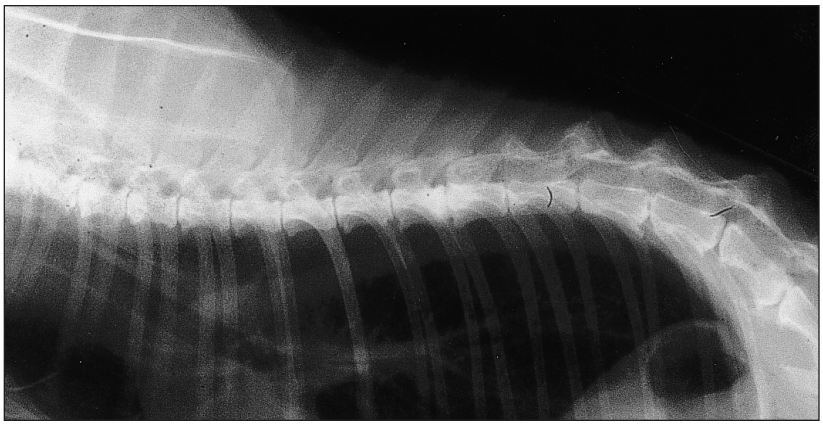

Figure 1—Lateral radiographic view of the thoracic vertebral region of a cat that received a grade of 2 on a scale of 0 to 3 for severity of radiographic changes. Notice enthesophytes on the ventral aspects of several intervertebral articulations. Loss of clarity of some of the facet articulations indicates early degenerative changes.

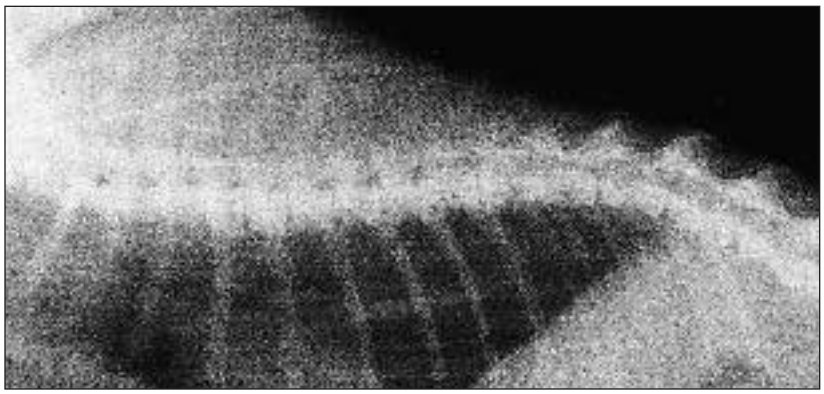

Figure 2—Lateral radiographic view of the thoracic vertebral region of a cat that received a grade of 3 for severity of radiographic changes. Notice extensive enthesophytes on the dorsal and ventral aspects of most of the intervertebral articulations and narrowing of many of the intervertebral disk spaces. Many of the vertebrae appear more radiodense than typical, suggesting extensive sclerosis or peripheral growth of new bone.

Figure 3—Lateral radiographic view of both elbow joints of a cat that received a grade of 2 for severity of radiographic changes. Notice periarticular new bone growth in both joints. The shape of the radial head is altered by osteophytes. Small mineralized opacities that appear free from the bones are visible in both joints.

Figure 4—Lateral radiographic view of both elbow joints of a cat that received a grade of 3 for severity of radiographic changes. Notice extensive periarticular new bone growth in both joints and an increase in radiodensity that suggests subchondral sclerosis of all bones. One joint has a mineralized opacity that appears separated from the bones.

and 12 of 15 appendicular joints graded 2 or 3 were elbow joints. Overall, 15 of 198 (8%) appendicular joint regions were graded 2 or 3. The most severely affected vertebral column structure was the lumbosacral articulation; 13 of 18 lumbosacral articulations were graded 2 or 3, representing 25% of all vertebral regions graded 2 or 3. Overall, 53 of 144 (37%) vertebral regions were graded 2 or 3.

There was no association between the following factors and vertebral or appendicular DJD of grade 2 or 3: age, sex, breed, exposure to the outdoors, sternal DJD of grade 2 or 3, dental disease, hyperthyroidism, cancer other than thyroid tumors, diabetes mellitus, urinary tract disease, cardiovascular disease, ocular disease, skin disease, digestive tract disease, dental disease, vaccination status, infection with FeLV, seropositivity for FIV, serum creatinine concentration > 2.3 mg/dl, and serum globulin concentration > 5.3 or < 2.8 gm/dl. There was no association between appendicular DJD of grade 2 or 3 and neurologic signs, but there was a significant association between neurologic signs and a vertebral DJD grade of 2 or 3 (6 of 42 cats with neurologic disease had grade-2 or -3 lesions).

Figure 5—Lateral radiograph view of the lumbosacral articulation of a cat with neurologic disease suspected to be secondary to degenerative changes at this site. Notice large ventral enthesophytes that nearly bridge the articulation completely. The intervertebral space is narrow, and the adjacent end plates are sclerotic.

The records of the 6 cats with vertebral DJD grade of 2 or 3 and neurologic disease were examined. One cat with seizures had a meningioma. The remaining 5 cats all had neurologic disease affecting the hind limbs. Of those cats, 1 had signs that were unilateral and associated with ilial osteosarcoma; the remaining 4 cats had bilateral hind limb weakness or ataxia. Difficulty rising and a plantigrade stance were reported in 2 cats. Two cats dragged their tails, and 2 cats had difficulty with urination and defection. The patellar, cranial tibial, and hind limb flexion reflexes were recorded in 3 cats and were normal. Pain on palpation of the lumbar region or lumbosacral articulation was reported in 3 cats. All 4 cats had severe DJD associated with the lumbosacral articulation. There was sclerosis of the L7-S1 end plates and collapse of the disk space in all 4 cats (**Fig 5**). In addition, 1 cat also had collapse of the L5-6 disk space. No further diagnostic tests were performed to characterize the neurologic disease in 3 cats. Cerebrospinal fluid analysis yielded results within reference range in 1 cat. One cat that was treated with strict crate confinement recovered, and 3 cats were euthanatized.

Only records of 4 cats contained any mention of DJD or arthritis by the owner or the clinician. Two of these cats had appendicular DJD grades of 2 or 3, and 1 had a veterbral DJD grade of 2 or 3.

Discussion

The cats represented in this study were not a random population. They were selected because they represented old, well cared for cats that were likely to have documentation of their known diseases. In no cat was DJD considered to be a major problem; rather, the cat was radiographed in the course of a diagnostic workup of other diseases. The intent of the study was to determine whether radiographic evidence of DJD was detected in old cats and whether DJD was associated with other diseases. The major findings were that evidence of DJD was detected in a large number of cats, vertebral DJD of grades 2 or 3 was associated with neurologic disease, and clinicians and owners failed to associate DJD with clinical signs in most instances.

Known underlying causes of DJD are osteoarthritis (DJD secondary to wear and tear, trauma, mechanical factors, and joint dysplasias), infectious arthritis (DJD secondary to direct joint infection), and the various forms of inflammatory arthritis (DJD secondary to nonseptic joint inflammation in genetically susceptible animals, often after exposure to a triggering antigen).[1,2] The most well-characterized forms of inflammatory arthritis are the various forms of spondyloarthropathy (ankylosing spondylitis, reactive arthritis, psoriatic arthritis, and arthritis of chronic inflammatory bowel disease) and rheumatoid arthritis.[1,2]

Most studies of joint disease in domestic cats have concentrated on young cats with signs of acute pain and obvious clinical signs of joint disease. As expected, most of these cats have infectious arthritis, spondyloarthopathy, or rheumatoid arthritis.[1,2] Similarly, in a study of joint disease in large cats of nondomestic species, spondyloarthropathy was the primary cause of joint disease.[4] Osteoarthritis was found only in large cats maintained in zoologic parks (presumably because the cats lived longer than animals caught in the wild).[4]

Given the age of the cats in our study, osteoarthritis was the most likely cause of DJD. However, in humans, some forms of spondyloarthropathy can cause slowly progressive disease, particularly when the vertebral column is affected. Thus, spondyloarthropathy must be considered as a possible cause of the DJD in cats.[5-7]

Several findings indicated that spondyloarthropathy was an unlikely cause of DJD in cats in our study. Most importantly, the radiographic features of the severely affected cats were more compatible with osteoarthritis than with spondyloarthropathy.[1,4] In addition to the radiographic findings, there was a lack of association between radiographic evidence of DJD graded 2 or 3 and disease conditions known to be associated with spondyloarthropathy.[4-6] The large number of cats affected with DJD does not correlate well with the documented incidence of spondyloarthropathy.[4-7] The most commonly affected appendicular joint was the elbow joint, which is not commonly affected in spondyloarthropathy.[4-7] Finally, the sternal joints were graded 2 or 3 in only 5 cats, and this grading was not associated with vertebral or appendicular joint DJD of grade 2 or 3.[4-6] Thus, it appears likely that DJD detected in cats in this study was caused by osteoarthritis, not spondyloarthropathy.

The underlying factors that cause osteoarthritis must be considered. We consider it likely to be secondary to undetermined factors such as elbow dysplasia, chronic low-grade trauma, or subtle malarticulation, rather than to primary degeneration (wear and tear).

A comment should be made regarding the lack of DJD found in the hip joints. Results of studies indicate that hip dysplasia occurs in cats (6.6% of 684 cats referred to a veterinary teaching hospital were affected)[8] and that hip laxity is associated with DJD.[9] Relatively few hip joints were visible in the radiographs of the cats in our study, but no hip joint was found to have DJD of grade 2 or 3. The contrast with the elbow joints was striking, but larger numbers of hip joints and elbow joints should be compared to confirm that the elbow joint is the appendicular joint most affected with DJD in cats.

The 4 cats with paraparesis, hind limb weakness, and vertebral DJD of grade 2 or 3 had DJD at the lumbosacral joint. The combination of lower motor neuron signs involving the tail and bladder, signs of pain over the lumbosacral joint, collapse of the L7-S1 disk space, sclerosis of the L7-S1 endplates, and lateral and ventral spondylosis deformans at the lumbosacral joint would be regarded as indications for consideration of lumbosacral disease if these animals were dogs.[10] It will be necessary to perform the appropriate diagnostic tests to determine whether this disease should also be routinely considered in cats.

The question arises as to whether a failure to observe clinical signs associated with DJD in the cats in this study truly represented a lack of clinical signs or a failure to recognize signs. Although radiographic signs of DJD and clinical signs are not well correlated,[11] cats have a remarkable ability to compensate for orthopedic disease, and chronic pain attributable to vertebral or bilateral elbow joint lesions may be difficult to recognize. Astute owners have noticed that subtle findings such as poor self hygiene, jumping on furniture in several small steps rather than 1 leap, inappropriate elimination outside the litter box, constipation, and poor posture when defecating or urinating represent signs of pain in cats.[2] Indeed, failure to consider lumbosacral disease as a cause of neurologic signs led to a failure to perform appropriate diagnostic tests in those cats. Similarly, in DJD of the elbow joint, the lack of easily recognizable clinical signs associated with the condition led to failure to characterize the underlying cause and provide treatment. A specific orthopedic examination was not performed on the affected joints, so it was not possible to determine how much functional loss was present in the elbow joints at the various grades of DJD observed radiographically. The bilateral nature of the change may have contributed to the difficulty in observing clinical signs.

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