



What Is Your Diagnosis?



Figure 1—Lateral (A) and craniocaudal (B) radiographic views of the left antebrachium and lateral (C) and craniocaudal (D) radiographic views of the right antebrachium of a 6-month-old 39-kg (86-lb) sexually intact male Irish Wolfhound evaluated for bilateral angular thoracic limb deformity with associated bilateral weight-bearing thoracic limb lameness.

History

A 6-month-old 39-kg (86-lb) sexually intact male Irish Wolfhound was evaluated for bilateral angular deformity of the thoracic limbs. The patient was fully vaccinated and was not receiving any medications at the time of examination. Physical examination revealed vital parameters that were within reference ranges, severe carpal valgus and external rotation of the right manus, and moderate carpal valgus and external rotation of the left manus. Pain was not elicited on palpation of any joints. No soft tissue swelling was present. On gait examination, a mild weight-bearing lameness of the thoracic limbs was observed bilaterally at the walk and trot. The lameness was more severe in the right thoracic limb. Radiographs of the right and left antebrachia 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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Radiographic Findings and Outcome

Similar radiographic changes are found in both antebrachia. There is an ill-defined, radiolucent zone



Figure 2—Same radiographic images as in Figure 1. Similar radiographic findings are identified in both antebrachia. An ill-defined, radiolucent zone is observed in the distal metaphysis of each ulna and parallels the distal ulnar physis (asterisks), with a triangular proximal extension toward the distal aspect of the diaphysis (arrowheads) surrounded by a thin, irregular rim of sclerosis. The distal radial physes appear normal. Mild, bilateral radial procurvatum is noted (white lines cranial to the radius; panels A and C) with focal osteosclerosis of the distal right radial metaphysis (pound sign; panel C). Carpal valgus is evident bilaterally and more severe in the right thoracic limb (white lines medial to the carpal joint; panel D). No evidence of soft tissue swelling is evident in either thoracic limb.

in the distal metaphysis of each ulna that parallels the physis with a triangular proximal extension toward the distal aspect of the diaphysis (**Figure 2**). The proximally projecting radiolucent regions are each surrounded by a thin, irregular rim of sclerosis. The distal radial physes are radiographically normal. There is mild, bilateral radial procurvatum with focal osteosclerosis of the distal right radial metaphysis. Carpal valgus is evident bilaterally and more severe in the right thoracic limb. No soft tissue swelling is identified radiographically in either thoracic limb.

On the basis of the young age of the dog, clinical signs, and lack of soft-tissue swelling associated with the bilateral ulnar lesions, a variant of ulnar retained cartilaginous core with secondary angular limb deformity (ie, bilateral radius curvus and carpal valgus) was considered most likely. Hypertrophic osteodystrophy and metaphyseal osteomyelitis were considered unlikely, as there was no pain elicited on palpation of the limbs and no evidence of associated soft tissue swelling, and the distal radial physes were not affected. The mild cranial bowing of the radial diaphysis observed bilaterally (Figure 2) was attributed to a mismatch in radial and ulnar elongation due to abnormal ulnar endochondral ossification. The focal distal metaphyseal sclerosis observed in the right radius was considered to represent adaptive bone remodeling secondary to the radius curvus, which was more severe in the right thoracic limb.

Treatment and Outcome

Given the severity of angular limb deformity as well as the young age and growth potential of the patient, a staged corrective osteotomy approach for realignment was recommended, consisting of a bilateral ulnar osteotomy followed by a bilateral corrective radial osteotomy once skeletal maturity had been reached. The owners did not wish to pursue treatment options, and the patient was returned to the breeder without the opportunity to obtain any further follow-up information.

Comments

Retained cartilaginous cores of the distal ulnar metaphysis and, less frequently, lateral femoral condyle, are an occasional radiographic finding in large-breed dogs with over representation of Irish Wolfhounds.¹⁻⁴ Typically, retained cartilaginous core lesions are described radiographically as a bilateral triangular, well-defined, and smoothly marginated radiolucent area within the distal ulnar metaphysis, sometimes surrounded by a thin rim of osteosclerosis adjacent to this radiolucency.¹⁻⁴ Variants of retained ulnar cartilage core have been sporadically reported in the literature, with more irregular radiolucencies involving the distal ulnar metaphysis.³ These atypical radiographic signs, as seen in the case described in the present report, could mislead a clinician to diagnose bilateral hypertrophic osteodystrophy or metaphyseal

osteomyelitis. However, the lack of soft tissue swelling associated with the lesion as well as the normal radial physis are not consistent with hypertrophic osteodystrophy or metaphyseal osteomyelitis. During intracartilaginous ossification, hyaline cartilage cells transition from a resting to a hypertrophied state prior to degeneration. Bone matrix is produced, which serves as the foundation for deposition of osteoid and development of mineralized bone.⁴ In the case of a retained cartilaginous core, disruption of normal endochondral ossification and retention of a center of hypertrophied cartilage cells are often associated with a lack of vascular supply to the tissue. Normal ossification occurs circumferentially around the retained cartilage.⁵ In the dog of the present report, the triangular radiolucent zones in the right and left ulnas represented hypertrophied hyaline cartilage that was radiolucent, compared with surrounding osseous tissue. This should not be confused with the radiographic lesions described with hypertrophic osteodystrophy (ie, double physeal sign) or metaphyseal osteomyelitis, where the radiolucent lesions observed radiographically are due to suppurative inflammation and necrosis in the metaphyseal region of the long bones evident on histologic evaluation.⁶ This difference in origin is important because the lack of endochondral ossification observed in cases of retained ulnar cartilage core will not induce any pain on palpation or inflammation of the surrounding soft tissue, in

contrast to the lytic lesions induced by metaphyseal osteomyelitis or hypertrophic osteodystrophy.

Finally, the presence of a retained cartilage core can also cause stunted ulnar growth, while the radius continues to grow at a normal rate.¹ Asynchronous growth of the radius and ulna in the most severe cases can result in cranial bowing of the radius, lateral rotation of the carpus, and abduction of the manus, as observed in the dog of the present report.⁵

The exact etiology of the retained cartilage core and the specific reasons why the radiographic changes in the case described in the present report were different from those typically observed with retained ulnar cartilage core lesions remain unknown.

References

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