What Is Your Diagnosis?

Figure 1—Dorsopalmar radiographic view of the right carpus of a 7-day-old foal evaluated because of bilateral carpus valgus.

History

A 7-day-old male foal was evaluated because of bilateral angular limb deformity (carpus valgus). The left forelimb could be completely straightened by means of manual manipulation, but the right forelimb could only be partially straightened. The foal was born after 330 days of gestation and appeared to be premature. Serum IgG concentration was less than 200 mg/dl when the foal was 1 day old; therefore, 500 ml of plasma was administered, IV. One day later, IgG concentration was 400 to 800 mg/dl. On physical examination, the foal appeared small for its age. Dorsopalmar and lateromedial radiographs were obtained of the carpi, including the distal portions of the radii and proximal portions of the metacarpi (Fig 1).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page.
Diagnosis

Radiographic diagnosis—Carpus valgus and hypoplasia of the carpal bones (Fig 2). The styloid process of the ulna is faintly visible and has not yet fused with the distal portion of the radius.

Comments

Radiographically, the carpal bones of both forelimbs were small with rounded edges and joint spaces were wide. The cuboidal bones were not ossified as would be expected in a 7-day-old foal.

Tube casts were applied to both forelimbs that extended from the proximal portions of the radii to the distal portions of the metacarpals. When radiography was repeated 13 days later, carpal bones appeared completely ossified and carpus valgus had greatly improved. Deformities of the cuboidal bones were not apparent on these radiographs, and tube casts were replaced with splints.

Many factors have been implicated as causes of hypoplastic or incompletely ossified cuboidal bones. Among these are low birth weight, placenta,2 severe prolonged metabolic disturbances,2 heavy parasitic infestation,2 colic,2 short (less than 320 days) gestation,2 twin foals,2 and hypothyroidism7 in foals. Affected foals may be born with angular limb deformities or may develop deformities during the first few days of life.

Ossification of carpal bones is endochondral, beginning in the core of the cartilaginous precursor and progressing circumferentially toward the periphery. The last carpal bones to undergo ossification during gestation are the third, fourth, and ulnar carpal bones and therefore, these bones are most susceptible to injury. Hypoplastic second and fourth carpal bones usually appear rounded and hypoplastic third carpal bones appear wedge shaped. Carpus valgus is the most common angular deformity observed in conjunction with hypoplastic carpal bones, because the third, fourth, and ulnar carpal bones are the most laterally located bones in the carpus.

Angular limb deformities resulting from hypoplastic carpal bones or ligamentous laxity can usually be manually corrected, whereas abnormalities resulting from abnormal physeal growth cannot. Radiography may help identify the source of the deformity and assist in determining prognosis. Dorsopalmar and lateromedial views are most useful in evaluating carpal angular limb deformities; however, proper radiographic positioning may be difficult because of rotation of the distal portion of the limb.

Early and aggressive management is the key to successful treatment of hypoplastic carpal bones. It is important to achieve axial alignment of affected limbs by use of tube casts or splints.2 Casts should be changed every 10 to 14 days and maintained until radiographic evidence of complete ossification of cuboidal bones is observed.8 Exercise should be limited to stall rest to prevent damage to delicate cartilage precursors of immature cuboidal bones.8 Stall rest alone, without casts or splints, may be adequate if cuboidal bones do not appear severely hypoplastic.2 However, if the angular limb deformity continues to worsen or is not improved in 4 to 6 weeks, more aggressive management, such as casts or splints, should be considered.6,8

Prognosis for a foal with hypoplastic carpal bones is usually guarded.7 If cuboidal bone deformities are observed on radiographs, prognosis may be poor. A good prognosis may be given if the diagnosis is made prior to radiographic evidence of cuboidal bone damage (fracture, crushing, wedging) and if the angular limb deformity is properly treated.2 It is important to realize that most angular limb deformities secondary to hypoplastic cuboidal bones are diagnosed too late to correct them and prevent degenerative joint disease.2 Therefore, it is advisable to radiograph carpi and tarsi on all premature or dysmature foals as part of the perinatal evaluation.


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