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What Is Your Diagnosis?

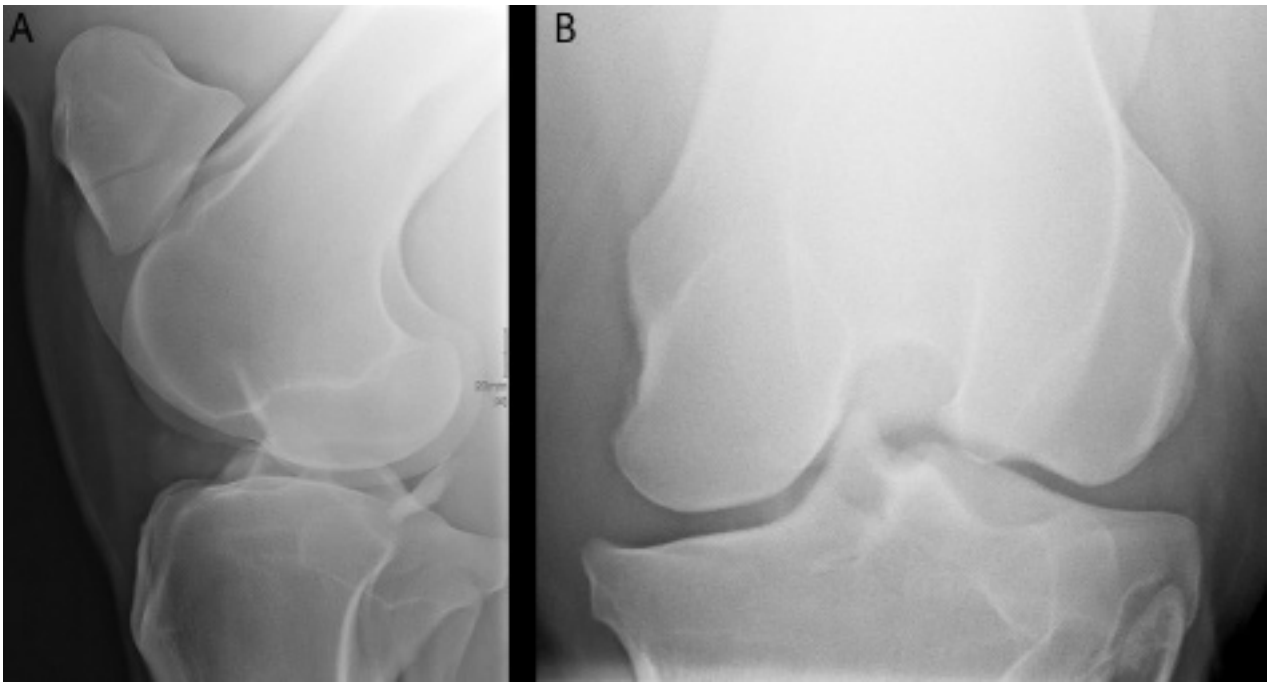

Figure 1—Lateromedial (A) and caudocranial (B) radiographic images of the left stifle joint of a 5-year-old 600-kg German Warmblood mare evaluated because of persistent left hind limb lameness and effusion of the left stifle joint.

History

A 5-year-old 600-kg German Warmblood mare was presented with lameness in the left hind limb and swelling of the left stifle joint. Two months earlier, the mare had jumped out of a water treadmill and sustained several injuries on both hind limbs in the process. Marked swelling had developed in the left stifle joint region immediately after the incident and had regressed substantially with stall rest; however, the left hind limb had residual lameness.

On physical examination, the mare had grade 3 lameness (on a scale from 0 [no lameness] to 5 [minimally to non–weight-bearing]) of the left hind limb and effusion of the medial compartment of the left femorotibial joint. A flexion test was initiated, and after flexing the left stifle joint without flexing the tarsus, the mare's lameness worsened. Thus, signs of lameness were localized to the left stifle joint region. On the basis of this finding, combined with the history of injuries from jumping out of the water treadmill, diagnostic intra-articular analgesia was not performed. Radiographic images of the left stifle joint were obtained **(Figure 1)**.

Formulate differential diagnoses and treatment strategies from the history, clinical findings, and Figure 1—then turn the page →

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Diagnostic Imaging Findings and Interpretation

A large elongated and well-defined bone fragment with smooth and rounded borders is evident caudodistal to the medial femoral condyle **(Figure 2)**. An abnormal concave lucency along the caudoproximomedial portion of the tibia was faintly visible and could have represented the fracture bed. Thus, an avulsion of the caudal cruciate ligament was suspected, and ultrasonographic examination of the left stifle joint was performed (not shown). Neither the bone fragment nor the caudodistal aspect of the caudate cruciate ligament was visualized ultrasonographically.

The horse underwent general anesthesia for cone-beam CT of the left stifle joint **(Figure 3)**. Two bone fragments were confirmed in the region identified radiographically, and a fracture bed was visible spanning the left tibia's caudal aspect of the intercondylar region and proximocaudal aspect of the medial condyle. With CT arthrography, contrast medium accumulated in the fracture bed and around the cranioventral aspect of the bone fragments from a synovial outpouching surrounding the caudal cruciate ligament **(Figure 4)**. The larger bone fragment had an extracapsular position, separated from the proximal recess of the caudal aspect of the medial compartment of the femorotibial joint. The smaller bone fragment was embedded in the synovial lining at the ventral aspect of the caudal cruciate ligament. These findings are compatible with an avulsion of the caudal cruciate ligament from the caudal intercondylar portion and incisura poplitea of the tibia.

Treatment and Outcome

Arthroscopy of the caudal aspect of the medial compartment of the left femorotibial joint was performed to further assess the cartilaginous surfaces and the meniscus and to attempt to remove the bony fragments. A caudomedial approach was made as described elsewhere.[1] Visualized areas of the caudal cruciate ligament were intact, and no fraying or tearing was observed. However, the bone fragments were not visible. Probing with a blunt conical obturator confirmed the presence of the larger fragment deep to the synovial lining. Minimally invasive removal of the fragment was not deemed possible. Arthroscopy was completed, and the mare recovered from anesthesia without complication but had a guarded prognosis for further athletic performance.

Follow-up information was obtained by telephone from the owner and primary veterinarian 1 year after the injury. The mare was reportedly sound. Ridden exercise had resumed 6 months after surgery, and the mare had successfully completed several high-level show jumping competitions 10 months after surgery, despite an overall poor prognosis described for cruciate ligament injuries in horses.[2]

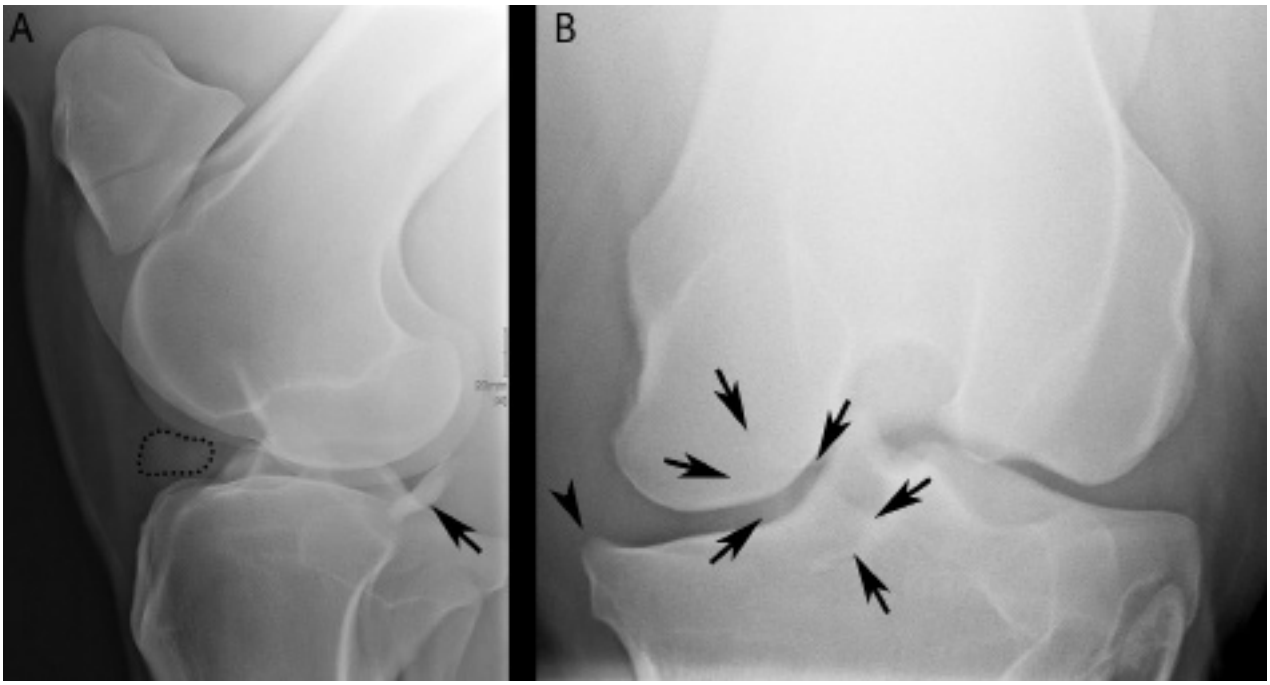

Figure 2—Same radiographic images as in Figure 1. A well-defined bone fragment (arrows) caudodistal to the medial femoral condyle is evident, more so on the lateromedial image (A) than the caudocranial image (B). The cranial aspect of the stifle joint has an area of increased opacity (dotted outline), and there is moderate osteophyte formation (arrowhead) on the medial aspect of the medial tibial condyle and medial femoral condyle.

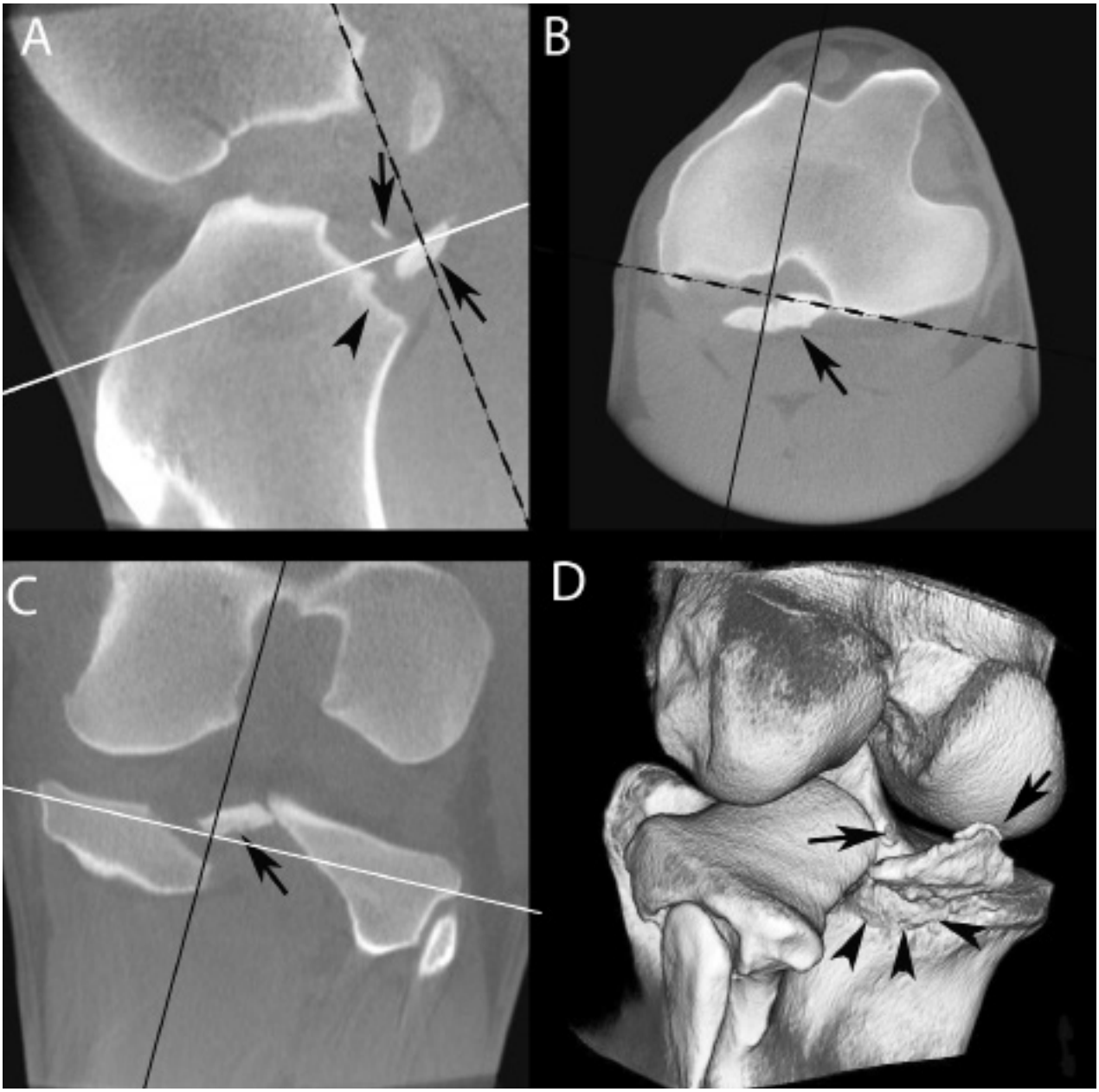

Figure 3—Sagittal (A), transverse (B), and dorsal (C) plane and 3-D (D) reconstructed CT images of the left stifle joint of the horse described in Figure 1. Two bone fragments (black arrows) are caudoproximal to the tibia. There is a large superficial bone defect with irregular margins (black arrowheads) spanning the tibia's caudal aspect of the tibial intercondylar region and proximocaudal aspect of the medial condyle. A through C—The lines (black, white, and dashed) across the images represent the planes of the other images (A, B, and C, respectively). A—Cranial is leftward. B—Cranial is upward, and lateral is rightward. C—Lateral is rightward. D—The caudolateral aspect of the stifle joint is presented.

Comments

Injuries to the caudal cruciate ligament are uncommon in horses.[3] Cranial cruciate ligament injuries occur more frequently, often accompanied by damage to other soft tissue structures, such as the medial meniscus and the medial collateral ligament.[4] The caudal cruciate ligament acts as a stabilizer of the medial aspect of the stifle joint and resists forces created by the medial slope of the intercondylar eminence during weight-bearing.[3] Trauma to the caudal cruciate ligament occurs most likely by stress in extension, especially by medial overloading in extension.[3] Injury to the caudal cruciate ligament may lead to chronic lameness, osteoarthritis, and eventually degenerative joint disease because of femorotibial joint instability.

Diagnosis of caudal cruciate ligament injury by ultrasonography combined with radiography has been described.[5] However, the depth of the caudal structures limits their visibility, which decreases the

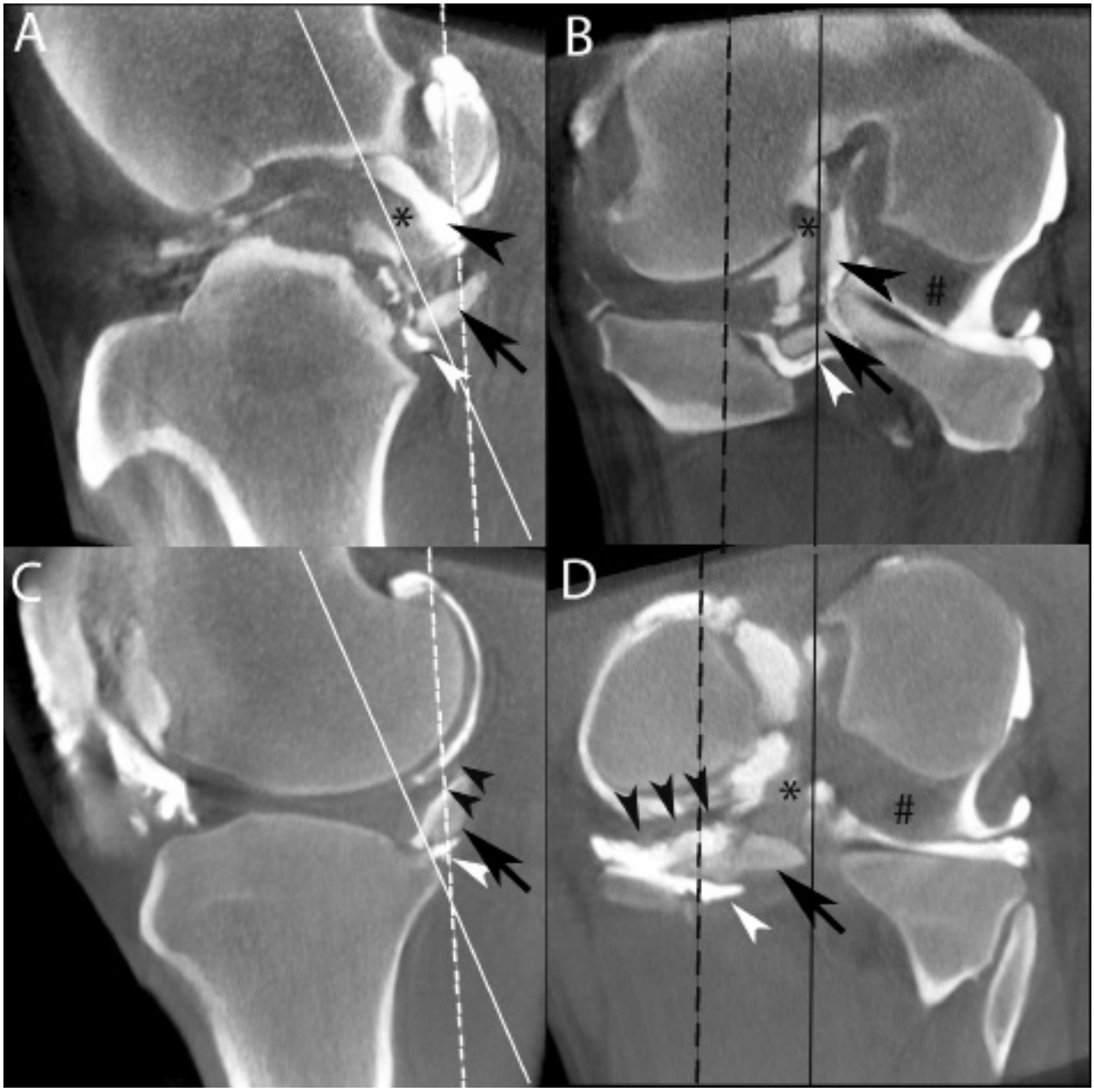

Figure 4—Sagittal (A and C) and dorsal (B and D) reconstruction with maximum intensity projection by cone-beam CT arthrography of the left stifle joint of the same horse. Contrast medium (white arrowheads) is evident around a bone fragment (arrows), except at the fragment's proximal aspect, where the caudal cruciate ligament (asterisks) attaches to the fragment. The fragment remains separated or spared from the contrast medium contained in the proximal recess of the medial compartment of the femorotibial joint (black arrowheads), consistent with the inability to visualize the fragment on arthroscopy. The surfaces of the articular cartilage, caudal cruciate ligament (asterisks), and lateral meniscus (pound sign) are well defined and show smooth margins. The lines (solid black, solid white, dashed black, and dashed white) across the images represent the planes of the other images (A, B, C, and D, respectively).

sensitivity of the ultrasonographic assessment. Our findings for the mare of the present report supported this in that ultrasonography failed to detect the fragments. On radiographic examination of this mare, the larger of the 2 bone fragments was visible and led us to suspect an avulsion fracture of the tibial attachment of the caudal cruciate ligament.

Computed tomography arthrography and MRI allow for more complete assessments of soft tissue structures, including the cruciate ligaments. Therefore, cruciate ligament injuries are more reliably diagnosed with CT or MRI than ultrasonography.[4,6] For the mare of the present report, CT arthrography provided valuable information regarding the extra-articular position of the bone fragments and the integrity of the exposed surfaces of the caudal cruciate ligament. The tibial attachment of the caudal cruciate ligament was in continuation with the larger bone fragment

and spared by contrast medium. Additionally, the contrast medium injected into the medial compartment of the left femorotibial joint did not reach the surface of the larger bone fragment, consistent with our findings on arthroscopy that this bone fragment was not directly accessible by an arthroscopic approach.

Because of the anatomic structure and biomechanical demands of the stifle joints in horses, there are no adequate surgical procedures to reinforce or reconstruct cruciate ligaments in horses.[7] Arthroscopic removal of intra-articular boney fragments and damaged tissues has been described, and mesenchymal stem cell therapy has been advocated[6]; however, generally, an overall poor prognosis regarding athletic function is given.[2]

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