



Case Report

Radiography and Standing Computed Tomography of an Osteochondritis Dissecans Lesion Found at the Dorsodistolateral Aspect of the Calcaneus in a 3-Year-Old Horse

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ARTICLE INFO

Article history:

Received 14 June 2020

Received in revised form

18 August 2020

Accepted 19 August 2020

Available online 1 September 2020

Keywords:

Osteochondrosis

Fragment

Equine

Tarsus

ABSTRACT

An incidental osteochondritis dissecans (OCD) lesion was found in a left tarsus of a 3-year-old Freiburger stallion presented for a prepurchase examination. The lesion was best visualized on the dorsomedial-plantarolateral oblique and dorsoplantar projections. A standing computed tomographic examination confirmed a fragmentation of the dorsodistolateral aspect of the calcaneus. In suspected OCD lesions at the distal aspect of the talus or calcaneus, a dorsoplantar projection of the tarsus improves lesion localization and could be added to the standard radiographic protocol during OCD screenings. Computed tomography allowed more detailed evaluation of a not previously described calcaneal origin of this uncommon presumed OCD lesion in the equine tarsus.

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1. Introduction

A 3-year-old Freiburger (Franches Montagnes) stallion was presented to the ISME Clinique Avenches, Switzerland, for a prepurchase examination requested by the National Stud. Initially, the stallion had passed a 40-day performance test and a radiographic evaluation focused on the navicular bones to be licensed for breeding. Multiple clinical examinations conducted before and during this 40-day period were unremarkable. No signs of lameness or articular swelling were observed before or during the period of these examinations. The radiographic examination revealed a conspicuous lesion in the left tarsus; therefore, the horse was referred for a standing cone beam computed tomography (CBCT) examination of the tarsus to the Division of Clinical Radiology from the Vetsuisse Faculty of Bern University.

Animal welfare/ethical statement: The authors performed this study according to Swiss legislation, and as the study implied retrospective analysis of data collected as part of routine clinical care, it did not require formal approval by an ethics committee.

Conflict of interest statement: The authors have no conflicts of interest or competing interests to disclose. The authors report no financial support or industry affiliation.

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2. Materials and Methods

Radiographs (POSKOM VET-20BT Portable X-Ray, UK; Canon CXDI-801C Wireless Digital Radiology System, CA) of the right and left tarsi were available for review. The studies included dorsoplantar (DPI), lateromedial, dorsolateral-plantaromedial oblique, and dorsomedial-plantarolateral oblique (DM-PILO) projections. The radiographs of the left tarsus revealed a mineral opaque fragment in direct contact with the dorsodistolateral aspect of the talus and calcaneus (Fig. 1A, B). A standing cone-beam computed tomographic examination (CBCT) examination (Medtronic, O-Arm MVS) of the left tarsus was requested to better define this change. The scan (512x512, 120 kVp, 16 mAs, reconstructed slice thickness 0.833 mm, 192 images per series) was performed in the bone algorithm, with the sedated horse restrained in stocks that are mounted on a hydraulic platform, as described elsewhere [1].

3. Results

The review of the radiographs revealed a triangular mineral opaque fragment, with smooth, well-defined margins at the axial aspect of the dorsodistolateral portion of the left calcaneus (Fig. 1A, B). The contour of the corresponding osseous defect in the

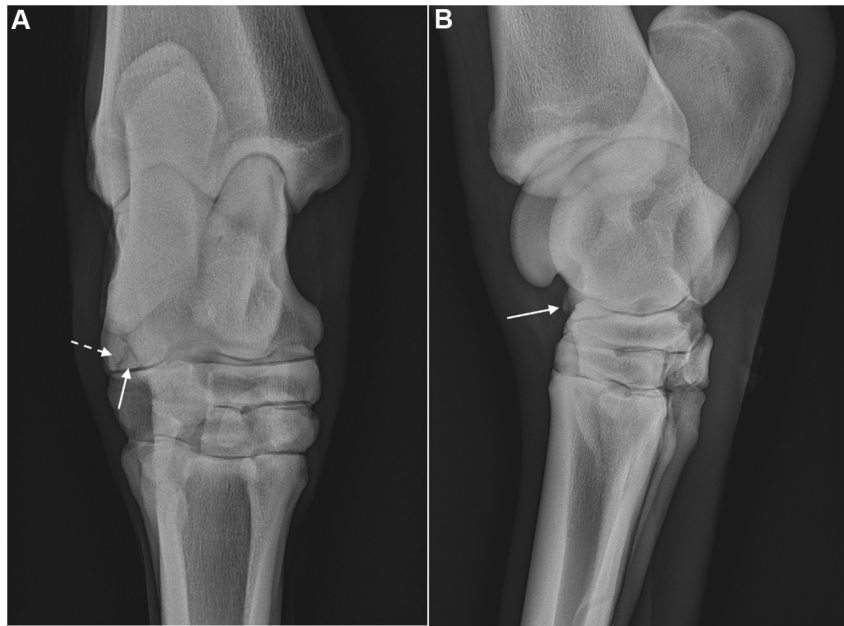


Fig. 1. (A) DPI radiographs of the left tarsus. (B) DM-PILO projection of the same tarsus. A triangular osseous fragment (solid arrow) is present at the dorsodistolateral aspect of the calcaneus. Note the irregular margins of the adjacent calcaneus in the DPI projection (dashed arrow). DM-PILO, dorsomedial-plantarolateral oblique; DPI, dorsoplantar.

calcaneus was mildly irregular. These findings were best identified in the DPI and DM-PILO projections. The surrounding periarticular soft tissues and remaining skeletal structures of the left tarsus were within normal limits. No abnormalities were identified in the right tarsus. Given the age and lack of previous clinical complaints or trauma, a presumptive diagnosis of osteochondritis dissecans (OCD) was made. However, considering that the calcaneus is not a known predilection site for tarsal OCD, a more detailed lesion evaluation with cross-sectional imaging was indicated.

On the CBCT images of the left tarsus, the dorsodistolateral aspect of the calcaneus was irregular in outline, and it showed moderate heterogeneity with small hypoattenuating areas (Fig. 2A-C). A small (approx. 5 mm) osseous fragment was observed within a concurrent defect at the dorsodistolateral aspect of the calcaneus, at its articular surfaces with the talus and fourth tarsal bone. A moderate amount of sclerosis was present in the surrounding bone. Considering these findings, an OCD lesion originating from the dorsodistolateral aspect of the left calcaneus was suspected.

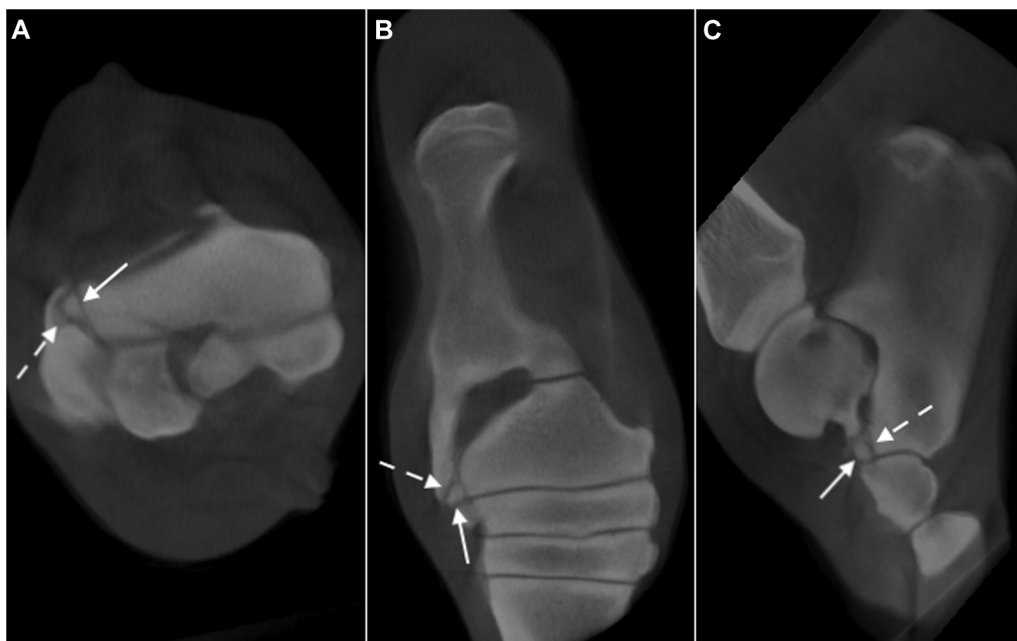


Fig. 2. Multiplanar computed tomographic reconstructed images of the left tarsus in transverse (A), dorsal (B), and sagittal (C) planes, illustrating the osseous fragment (solid arrow) and the concurrent defect in the dorsodistolateral aspect of the calcaneus (dashed arrow).

4. Discussion

Osteochondrosis (OC) has been widely described in horses and other animals (i.e., pigs, dogs, and poultry) [2–4]. It is defined as a focal ischemic necrosis of the developing cartilage leading to a focal failure of endochondral ossification and is thought to be multifactorial [2,4–7]. Positive correlation between the incidence of bacterial infections in foals less than 6-month-old and higher prevalence of OC in hock joints has been suggested [8]. Many studies have indicated polygenetic inheritance of OC in horses and differences in the prevalence of the disease between breeds and breeding line [9–12]. However, the literature about hereditary diseases in Freiberger horses is scarce and to the author's experience (A.R.), OC in Freiberger is rare [13].

In horses, the tarsocrural joint is frequently affected, and the most commonly reported predilection sites for OCD lesions in the tarsocrural joint are located at the cranial aspect of the distal intermediate ridge of the tibia, the dorsodistal aspect of the lateral trochlear ridge of the talus, and the axial aspect of the medial malleolus [14–18]. Other rarely reported locations include medial trochlear ridge and the lateral malleolus [6,14,17,19–21]. The typical predilection sites are best visualized in the dorso 55° to 65° medial-plantarolateral oblique (D65M-PILO), dorso 10° lateral-plantaromedial oblique (D10L-PIMO), and LM views of the tarsus; therefore, OCD screenings in horses are often limited to these views [15,17,22,23]. The appearance of the distal talus and calcaneus are similar in the DPL and D10L-PIMO projections, hence both allowed visualization of the calcaneal fragment. Because a standardized international radiographic protocol is lacking, a DPL is often excluded from health screenings reported in the literature [8,24–26]. Therefore lesions described here may have been overlooked in previous studies. Two publications mention osteochondral fragments at the dorsodistolateral aspect of the talus as an additional, unusual site for OCD lesions in the equine tarsus [14,19]. Steel et al [27] described fragments at the dorsodistal aspect of the talus (FDDT), which were best identified on the D65M-PILO radiographic projections, and rarely on LM projections. Among 5,709 juvenile Thoroughbreds they evaluated, FDDT were diagnosed in only 36 (0.63%) [27]. This is similar to the reported prevalence of OCD in the lateral malleolus of the tibia or medial trochlear ridge of the talus [27,28].

The horse presented here was asymptomatic as reported in the previous study by Steel et al [27]. It had a unilateral lesion with osseous fragmentation clearly visible at the dorsodistal aspect of the talus on the D65M-PILO radiograph. However, the DPL projection was essential to show the association of the fragment with the calcaneus. This was confirmed on the CBCT, which allowed more precise localization of the lesion and evaluation of the adjacent osseous structures. Therefore, it can be speculated that some horses analyzed in the previous studies could have in fact presented lesions at the dorsodistolateral aspect of the calcaneus rather than at the dorsodistolateral aspect of the talus.

The term “juvenile osteochondral condition” has been recently suggested to group both OCD conditions and other osteochondral diseases of developmental or traumatic origin to which genetics, nutrition, exercise regimen, and breed disposition may contribute [12,24]. Steel et al [27] suggested a traumatic origin of FDDT, in combination with increased body weight or a predisposing anatomic variation in the joint. However, earlier publications have identified the distal talus as a rare predilection site for tarsal OCD [14,19]. Because of the location and shape of the lesion observed in this study, the authors consider a traumatic origin unlikely. In addition, other findings such as lameness, soft tissue swelling,

abrupt or remodeled edges of the osseous fragment, or radiographic signs of bone healing (i.e., new bone formation) indicative of a possible trauma, were absent in this case. Osteochondral fragmentation or metaplasia in association with ligamentous or capsular insertions has been reported to cause fragmentation in other joints [19–21]. Although the pathogenesis of the calcaneal fragment could not be determined histologically, the lack of ligament insertion and joint motion makes a focal failure of endochondral ossification the most likely etiology [18,29]. Therefore, the presumptive diagnosis of a unilateral OCD lesion at the dorsodistolateral aspect of the calcaneus in the left tarsus was made. Although tarsal OCD is often bilateral, no radiographic changes were observed in the contralateral limb [3,4]. Given the financial aspects, lack of symptoms or radiographic changes, and the as low as reasonably achievable principle regarding unnecessary exposure to the staff and the patient, it was decided against computed tomography scan of the other leg. The indications for surgical intervention reported in the literature were absent; therefore, arthroscopy was not performed [6,30–32]. Because of the axial location of the fragment, surgical fragment removal would require aggressive resection of tissues overlaying the fragment at the dorsodistolateral border of the calcaneus (see Fig. 2A). The surgical approach and the associated disruption of the adjacent articular structures would likely cause more collateral damage and morbidity than the clinically silent lesion itself. Because the fragment is well embedded in the surrounding tissues, it is unlikely to become dislodged into the proximal intertarsal or tarsocrural joint, where it could cause cartilage damage, osteoarthritis, or lameness in the future. The horse has remained sound until the last clinical follow-up available 3 months after the diagnosis; therefore, no further checkups have been scheduled.

Regardless of the etiology, uncomplicated OC in the tarsus of young horses does not always affect their future athletic performance [27,28,33]. Once symptomatic, however, it may have long-term negative effects on welfare, longevity, and performance [10,34].

To the author's knowledge there are no previous reports of OCD lesions originating from the calcaneus.

5. Conclusions

In our case, it was the D65M-PILO view, which revealed the presence of the OCD lesion. Nonetheless, the DPL radiograph was crucial to establish the exact localization of the lesion, which was later confirmed by CBCT. Considering these findings, in suspicion of OCD lesions at the dorsodistolateral aspect of the talus and calcaneus, a DPL radiograph could be added to the standard radiographic protocol for health screening. However, this type of fragment should not be mistaken for a fragment of traumatic origin. When in doubt, computed tomography may be considered for detailed evaluation of the adjacent osseous structures and help establish a more detailed diagnosis in clinical cases.

Acknowledgments

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authorship: All the authors named in this manuscript have agreed for authorship, read, reviewed and approved the manuscript, and given consent for submission and subsequent publication of the manuscript. The manuscript has not been submitted or published elsewhere.

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