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CASE REPORT

Low-Field Magnetic Resonance Imaging Feature of Severe Chronic Fetlock Injury in a Horse

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A B S T R A C T

A German warmblood horse with severe soft tissue swelling of the fetlock joint showed a minimal weight-bearing during the motion and at rest and presented with pain on palpation. Ultrasonography was used to evaluate soft tissue including tendons and ligaments, but the assessment by sonogram was unproductive due to poor skin contact and severe acoustic attenuation. On low-field MRI, severe multiple chronic tendinopathy, desmopathy and sesamoiditis with skin thickening of affected extremity was evidently apparent. In this case, most of the major lesions including tendon, ligament, and connective tissues were successfully evaluated using low-field MRI, while the sonographic examination is not possible due to the extensive skin problems. Low-field MRI was performed for more reliable imaging modality to examine equine fetlock joint with severe chronic lesions.

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INTRODUCTION

The metacarpo (tarso) phalangeal joint, also called fetlock joint regions are commonly injured in equine extremities. Bone injuries such as fractures and osteochondral injuries are commonly diagnosed using radiography. The soft tissue structures such as superficial digital flexor tendon (SDFT), deep digital flexor tendon (DDFT) and suspensory ligament (SL) of this joint region are well evaluated by MR imaging when radiographs and sonography fail to make a diagnosis (King *et al.*, 2013). Though sonography is a practical, inexpensive, and readily accessible imaging technique for soft tissue injuries, it has many limitations. The quality of the image is directly related to the operator, the equipment, and the status of lesion being examined (Whitcomb, 2009).

When ultrasonography examination is not possible or difficult to identify soft tissue lesions using, magnetic resonance imaging (MRI) would be a good alternative. With the recent introduction of MRI to equine musculoskeletal imaging, it is now considered the gold standard to assess lameness originating from the carpus and tarsus distally. It provides an excellent visualization of soft tissue and osseous injuries. Furthermore, it is the only imaging modality that can assess all the tissues in a single examination (Barrett and Frisbie, 2012).

In this case, the patient with chronic complex lesions on his fetlock region underwent ultrasonography in order to examine and/or ligament injury. On account of poor skin contact and severe acoustic attenuation, the approach by sonogram was unsuccessful. Therefor low-field MRI examination was then performed to evaluate the fetlock region.

Animal history and examination: A German warmblood horse (18-year-old, gelding) with severe soft tissue swelling of fetlock joint region of left hind limb was referred for further evaluation. The patient showed a minimal weight-bearing during the motion and at rest and presented with pain on palpation. The patient was medicated using non-steroidal anti-inflammatory drugs (NSAIDs) and received acupuncture by a private practitioner at his early age. But clinical signs reoccurred and the patient was deteriorated for the past five years. Initially, radiography and ultrasonography were performed. Radiography revealed the presence of severe soft tissue swelling of the left fetlock region and new bone formation in the proximal sesamoid bones. Mineralization of extensor branch of suspensory ligament was also suspected (Fig. 1). On radiological examinations, the patient was diagnosed with sesamoiditis with suspensory ligament mineralization.

Findings: Sonogrpahic evaluation was not possible, however, to assess the lesion due to the extensive skin problems. The thick and very filthy skin prevented the penetration of ultrasound beam from displaying the lesions. For further examination of the lesion, MR

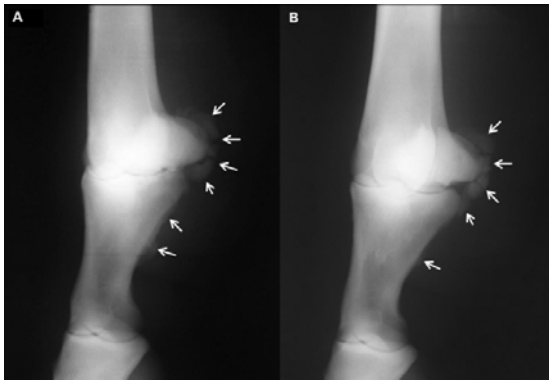

Fig. 1: Dorsomedial-palmarolateral oblique (A) and Dorsolateral-palmaromedial oblique (B) radiographs of the fetlock joint. Irregular new bone formation on the abaxial aspect of the proximal sesamoid bones lateral branch of the suspensory ligament regions (white arrows).

imaging was to be considered essential, but the owner declined further assessment for more accurate diagnosis and treatments. Unfortunately, euthanasia was elected at the owner's request. Low-field (0.25T) MRI (Vet-MR GRANDE, ESAOTE, Genova, Italy) was used to assess the lesion on donated cadaver, immediately after euthanasia.

Multiple tendon and ligament damage were identified by MR scanning. High-signal intensity at the plantar aspect of the SDFT is apparent on T1- and T2-weighted MR and proton intensity images. The swollen SDFT had an indistinct irregular margin. The DDFT showed intermediate-signal intensity on T1-weighted images and low-signal intensity on T2-weighted image and proton density image. It was difficult to identify the decreased diameter of DDFT because of a presence of an unremarkable, irregular margin (Fig. 2, 3). A heterogeneous, focal high-signal lesion with an ill-defined margin was observed in the straight sesamoidean ligament and oblique sesamoidean one (Fig. 4). Intermediate-signal intensity with focal high intensity was found on the caudal aspect of the proximal sesamoid bone (Fig. 3, 5). The skin layers had a thickness of approximately 2 cm.

Histological examinations revealed that there were a moderate vascular proliferation with a mild perivascular mucin deposition, which was accompanied by such findings as occasional hemosiderins, the infiltration of lymphocytes and lesser plasma cells, the dystrophic mineralization and the locally extensive presence of the fibrin exudation with a necrosis. These findings are suggestive of the previous presence of tendon injury that is secondary to the current chronic inflammation.

DISCUSSION

MR imaging has been used to examine the distal extremities in equine patients (Jaskólska *et al*., 2013). Low field MR has come into wide use in veterinary medicine due to financial reasons and easy accessibility, though it has some limitations to depict very subtle lesions (Konar and Lang, 2011).

Generally, normal tendon shows very low-signal intensity and it appears black on T1- and T2-weighted images, and normal ligament also shows a fairly homogenous, low-signal intensity. Acutely injured tendons and ligaments present hyperintense. With initiation of wound healing in tendon or ligament injury, the signal intensity begins to decreased (Crass *et al*., 1992). It is common to observe low- to intermediate-signal intensity and irregular shape in chronic tendon or ligament injury. Mineralization within the injured tendon or ligament results in intermediate-signal intensity (Zubrod and Barrett, 2007). In this case, the patient with chronic fetlock joint injury, the SDFT tendon showed intermediate to high signal intensity and irregular shape, which is suggestive of the progression of chronic ongoing inflammation. The decreased diameter of DDFT is considered partial rupture and involution.

Marked proliferation of the bone along the abaxial margin of the sesamoid with increased bone density observed on radiography and MR imaging is compatible with sesamoiditis. It is characterized by pain associated with the proximal sesamoid bones and insertions of the suspensory ligament, which eventually leads to the occurrence of lameness. Radiography showed variability in changes from the early remodeling in response to the bones to the increased bone density as well as a marked proliferation of the bone along the abaxial margin of the sesamoid. Evidence of significant sesamoiditis indicates a five times greater risk of developing clinical suspensory ligament branch injury in horses. (McLellan and Plevin, 2014). The suspensory ligament and the distal sesamoidean ligaments were demonstrated as calcified lesions on MR examination in this case.

Fetlock joint swelling could be caused by the ligament and tendon injury, massive thickening of the skin structure resulted in distinct swollen soft tissue. The soft tissue swelling of this patient may be the result of chronic progressive lymphedema (CPL) and secondary cellulitis. The CPL is a deteriorating disease that affects several large draught horse breeds. Systemic failure of the lymph system and the skin elastic network are a causative factor. Cutaneous changes and deformation of the lower limbs

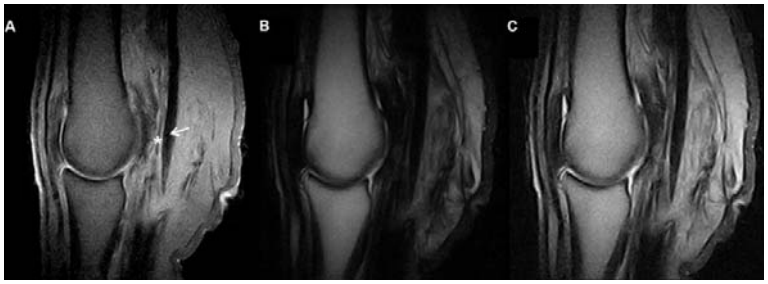

Fig. 2: Mid-sagittal T1-weighted (A), T2-weighted (B) and proton density(C) images of the fetlock region. Thickened SDFT (white arrow) and shrunken DDFT is noted (asterisk).

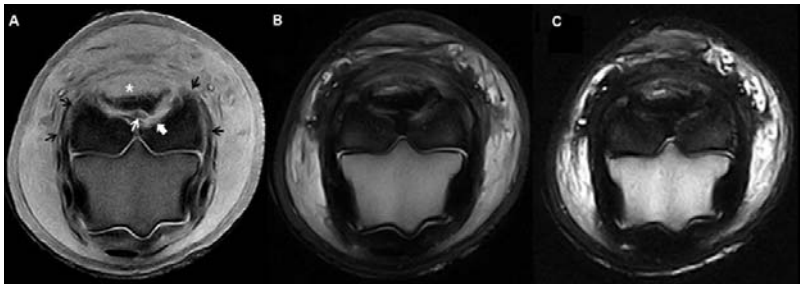

Fig. 3: Transverse T1-weighted (A), T2-weighted (B) and STIR (C) images of proximal sesamoid bone level of the fetlock region. Thickened SDFT with discrete areas of abnormal increased signal intensity (asterisk) is observed. Abnormal intermediate signal intensity within the DDFT (thin white arrow) is noticeable. Irregular new bone formation on abaxial aspect (black arrows) and discrete area of abnormal increased signal intensity of the proximal sesamoid bone (thick white arrow) are identified.

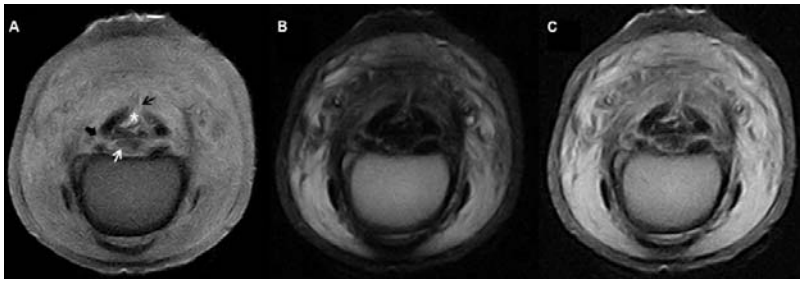

Fig. 4: Transverse T1-weighted (A), T2-weighted (B) and proton density (C) images of proximal third phalanx level of the fetlock region. There are discrete area of abnormal increased signal intensity within the SDFT (thin black arrow), DDFT (asterisk), oblique sesamoidean ligament (thick black arrow) and straight sesamoidean ligament (thin white arrow).

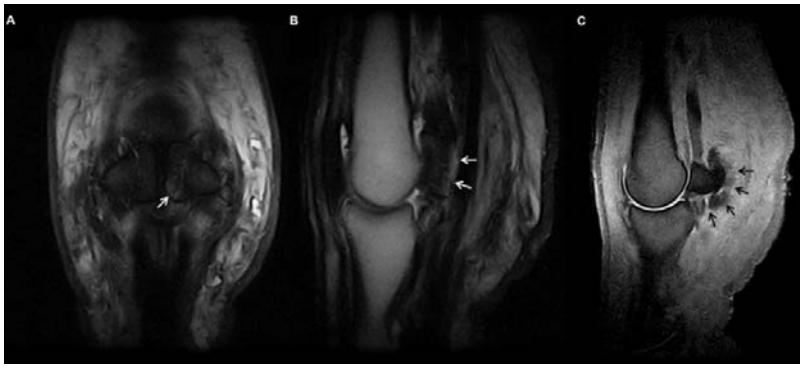

Fig. 5: Dorsal T2-weighted (A), parasagittal T2-weighted (B) and T1-weighted (C) images of the fetlock region. There is focal high-signal lesion (thin white arrows) and new bone formation (thin black arrow) in the proximal sesamoid bone.

occur as a result of the decreased lymphatic drainage. Clinical signs may appear early (less than 2 years) and mostly aggravate through life, often ending with severe disability justifying euthanasia (De Keyser *et al*., 2012).

Conclusion: Low-field MR imaging might be useful and reliable imaging modality for evaluation tendon, ligament, connective tissue and bony tissue in equine patient with severe chronic lesions in extremities while ultrasonography is limited significantly when accompanied by severe and extensive skin problems.

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