Multifactorial severe lameness in a horse originating from the fetlock region as a diagnostic challenge – a case report

Kristína Žuffová, Olga Dobešová

University of Veterinary Sciences Brno, Faculty of Veterinary Medicine, Equine Clinic, Brno, Czech Republic

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Abstract

A 6-year-old thoroughbred gelding was admitted to the clinic with acute severe lameness and swelling of the front limb fetlock area. The traditional examination methods (clinical, radiography, and ultrasonography) were insufficient to identify the exact pathological changes causing the lameness. Despite conservative treatment, the condition of the horse deteriorated and the horse was euthanized after 15 days. A diagnosis was determined by *post mortem* CT examination and an autopsy of the affected limb. From several pathological findings, an acute cystoid lesion in the first phalanx communicating with the fetlock joint was determined to be the probable main cause of the severe lameness in this horse.

Equine, joint, computed tomography, subchondral bone, cyst-like lesion

In all types of horses, the fetlock joint represents a very common source of lameness due to the occurrence of degenerative joint disease or traumatic lesions. Such disorders can be thoroughly examined by means of radiography and ultrasonography (Richard and Alexander 2007). Radiographic findings do not have a direct correlation with the severity of lameness, e.g. a possible osseous remodelling may not be identifiable on radiographs taken in the early stages. With ultrasonography it is possible to non-invasively evaluate the majority of soft tissues. The main limitation of the fetlock joint in terms of ultrasonography is an insufficient display of the proximal joint surface of the long pastern bone and the palmar/plantar joint surface of the third metacarpus/metatarsus. Inconclusive findings obtained by radiography or ultrasonography occasionally make it necessary to use other diagnostic methods such as computed tomography (CT) and magnetic resonance imaging (Hanson et al. 1996). There are some limitations to these methods, though, like the possible need for general anaesthesia and an operating table as well as the high initial and ongoing maintenance costs.

The aim of this study was to present the complex involvement of the forelimb fetlock area in the horse and to emphasize the need for various diagnostic methods (both *in vivo* and *post mortem*) to identify pathological findings causing pain and lameness.

Case Report

Case history

A six-year-old Thoroughbred gelding was admitted to the Equine Clinic of the University of Veterinary Sciences Brno, Czech Republic. Two weeks prior to admission it was kicked by another horse and a swelling developed in the area of the right elbow joint and the fetlock joint of the left forelimb.

Clinical findings and para-clinical examination

The horse demonstrated severe lameness on the left forelimb when walking on a hard surface (grade 4–5/5 according to the American Association of Equine Practitioners' scale).

Address for correspondence:
Kristína Žuffová
Equine Clinic
University of Veterinary Sciences Brno
Palackého třída 1946/1, 61200, Brno

Phone: +420 777 742 485
Email: zuffovak@vfu.cz
http://actavet.vfu.cz/

A hard, painful, and warm swelling was palpated at the dorsolateral aspect of the fetlock joint with no evidence on the skin above. Passive flexion of the fetlock joint was extremely painful.

Diagnostic imaging and arthrocentesis

Initial radiography of the left fetlock area was performed at the time of admission with a GIERTH RHF 200ML machine (GIERTH X-Ray int. GmbH, Riesa, Germany), using an Agfa indirect radiographic system (CR 30-X Agfa, Agfa HealthCare NV, Ghent, Belgium) and Dicom Viewer reading programme (Dicom, Arlington, USA). On a dorso-15°proximo-palmarodistal oblique view (D15Pr-PaDiO), the presence of soft tissue oedema on the lateral side of the fetlock joint, an ill-defined radiolucent area in distal metacarpus (McIII) medially from its sagittal ridge, and a mild radiolucent area with surrounding sclerotisation in the subchondral bone plate of the first phalanx medially from the medial condylar groove was observed (Plate I, Fig. 1). Subsequent ultrasonographic evaluation of the fetlock joint with a Honda HS 2100 machine using a linear 7.5 MHz probe (Honda Electronics CO., Ltd., Aichi, Japan) revealed an increased amount of anechogenic synovial fluid in the dorsal recess as well as in the lateral (Plate I, Fig. 2) and medial recess, where also the thickening of the synovial membrane was detected. In the dorso-lateral aspect of the fetlock joint, two foreign bodies with an acoustic shadow of approximately 0.5 cm above the joint articular margins were found. Echogenic material, indicative of necrotic tissue, was detectable in their surroundings (Plate II, Fig. 3). Diagnostic arthrocentesis from the fetlock joint was performed. Five ml of slightly orange, low viscose synovial fluid were obtained with cytological characteristic being indicative of an aseptic inflammation. A palmar digital block using 2.5 ml bupivacaine hydrochloride (Marcaine 0.5%, AstraZeneca PLC, London, England) was performed with no improvement. Further, intraarticular anaesthesia of the fetlock joint using 5 ml mepivacaine hydrochloride (Mepivastesin 3%, 3 M Deutschland GmbH, Neuss, Germany) was performed with approximately 30% improvement in lameness 10 min after the administration when walking in straight lines but with persisting lameness during walking in circles. Abaxial sesamoid block with 2.5 ml bupivacaine hydrochloride (Marcaine 0.5%, AstraZeneca) was subsequently performed with complete resolution of lameness when walking in straight lines as well as in circles with full weight bearing on the sole surface. Evaluation in trot was not assessed due to the initial lameness severity.

Surgical treatment

The next day it was decided to surgically remove both foreign bodies from the dorso-lateral area of the fetlock joint of the left forelimb. The horse was induced to analgosedation with a combination of detomidine hydrochloride (Cepesedan 10 mg/ml, 0.012 mg/kg body weight [BW] Pharma Handelsges, mbH, Burgdorf, Germany) and butorphanol (Butomidor 10 mg/ml, 0.025 mg/kg BW, Richter Pharma AG, Wels, Austria) and low four-point palmar block with 3 ml bupivacaine hydrochloride (Marcaine 0.5%, AstraZeneca) on each side. After the dissection of the subcutis, two plant thorns were identified and removed (Plate II, Fig. 4). The surrounding infected granulation and fibrotic tissue was resected to the extent of minimally 1 cm around each foreign body with subsequent debridement and suture. Then the fetlock joint was punctured via the medial proximal pouch followed by a lavage using 80 ml amikacin disulphate (Amikacin B. 10 mg/ml, B. Braun Melsungen AG, Melsungen, Germany) with 20 ml of amikacin left inside the joint. The horse was systemically medicated by benzylpenicillinum kalicum (Penicilin G draselná soľ BBP; 5 MIU [million international units], AtB Pharma, s.r.o., Martin, Slovakia), 25 000 IU/kg BW intravenously (IV) four times a day, gentamicin sulphate (Aagent 50 mg/ml, FATRO S.p.A., Bologna, Italy) 6.6 mg/kg BW IV every 24 h and flunixin meglumine (Flunixin

50 mg/kg, Norbrook Laboratories Limited, Newry, Northern Ireland) 1.1 mg/kg BW IV twice a day.

Results

Day 4–10 post surgery

After the surgery no clinical improvement in lameness of the affected limb was observed. The covering bandage was changed on a regular basis and two repeated arthrocenteses and cytology of the synovial fluid revealed only slight aseptic inflammatory changes.

On a dorso-15°-proximo-palmarodistal view (D15Pr-PaDiO), the radiolucent area of the medial condyle of McIII and the first phalanx were slightly more apparent compared to the initial radiographs. A smaller oval radiolucent area approximately in the middle of the distal part of lateral McIII condyle was detected (Plate II, Fig. 5).

Day 10–15 post surgery

The clinical status of the horse gradually improved and on day 13 post surgery, all medication was withdrawn. On day 15 post surgery, the horse was willing to bear its full weight on the left forelimb and the cast bandage was removed. Almost immediately, the horse demonstrated severe lameness while walking. On dorso-10°-proximo-palmarodistal oblique projection (D10Pr-PaDiO), the original ill-defined radiolucency medially from the sagittal groove of the first phalanx changed to an obvious cyst-like lesion with a radio-opaque acoustic shadow in its proximal part that resembled an osseous fragment. Similarly, the radiolucency in McIII lateral condyle deteriorated (Plate II, Fig. 6). A diagnostic-therapeutic arthroscopy of the fetlock joint was suggested to the owner, but due to financial limits and a guarded prognosis, the horse was euthanized. The left distal forelimb was taken from the cadaver and CT scanning was performed.

Post mortem CT findings

For CT scanning, a 16-slice MDCT (multidetector computed tomography) LightSpeed technology was used (GE Medical system, Milan, Italy). Slice thickness of 1.25 mm and helical scanning were chosen (Pitch 0.938, standard reconstructive algorithm) with subsequent retrospective reconstruction with slice thickness of 0.625 mm (bone reconstructive algorithm). On CT scans an irregular soft tissue swelling at the dorso-lateral aspect of the distal metacarpal epiphysis was visible (Plate III, Fig. 7). All these changes were likely due to inflammation caused by the previously removed foreign bodies. A large, irregular, ill-defined hypo-attenuating area was present in the proximal subchondral bone of the first phalanx, just medially to the sulcus (Plate III, IV, Figs 7, 8). A smaller hypo-attenuating area was present in the opposite subchondral bone of the metacarpus (Fig. 7). A third hypo-attenuating area was visible in the subchondral bone of the lateral metacarpal condyle (Figs 7, 9). All three areas extended to the articular surface and were surrounded by sclerosis. Small fissure lines were seen in the subchondral bone surrounding the largest hypo-attenuating area (Fig. 8). There was a mild osteophyte formation within the fetlock joint. In the transversal plane the pathology of the lateral condyle was located dorsally of its transverse ridge; the pathology of the medial condyle was present palmar from the transverse ridge. In the sagittal plane the subchondral bone lesion was located mainly in the area of the transverse ridge. Condyles themselves were not flattened (Plate IV, Figs 10, 11).

Pathomorphological examination

On dissection, the joint capsule was completely intact even in the very proximity of the original foreign bodies (thorns). The synovial fluid from the fetlock joint was yellow, viscous and without any pathological content. In the parasagittal grooves of both

lateral and medial metacarpal (McIII) condyle, oval cartilage ulcerations were present. In the medial condyle the changes were less severe. Underneath the damaged cartilage the subchondral bone was occasionally detected. On the medial proximal joint surface of the first phalanx, an oval cartilage lesion was present and a soft tissue (pannus) protruded to its sagittal groove (Plate V, Fig. 12). The most obvious cartilage damage with wear lines of grade 2–3 (Kawcak et al. 2008) was seen in the area of the lateral condyle. Discolouration of subchondral bone was apparent in the palmar aspect of the distal metacarpus (Plate V, Fig. 13). On the proximal joint surface of the first phalanx, medially from the condylar groove, another oval cartilage lesion reaching deeper to the subchondral bone was present (Plate VI, Fig. 14). Further, an incision was performed in the very lateral edge of the cartilage lesion of the first phalanx. The cyst-like lesion reached deep into the subchondral bone with a bone fragment found inside (a full thickness defect) (Plate VI, Fig. 15). The fragment could be easily removed from its cavity. The area of the McIII medial condyle damage corresponded with its location to the cyst-like lesion in the first phalanx (Plate VI, Fig. 16).

Discussion

For proper evaluation of osseous structures, it is recommended to perform at least four basic X-ray projections – dorso-palmar (D-Pa), latero-medial (LM), dorso-45°-latero-palmaromedial oblique (D45L-PaMO) and dorso-45°-medio-palmarolateral oblique (D45M-PaLO). If needed, these projections can be complemented by other unconventional projections (Richard and Alexander 2007). In our patient, during the initial examination, ill-defined radiolucent areas in the proximo-medial part of the first phalanx and the disto-medial part of the third metacarpus were found only on the dorso-15°-proximo-palmarodistal oblique (D15Pr-PaDiO) projection.

Ultrasonographic examination of the fetlock area revealed two foreign bodies (thorns), which, together with severe inflammation of the subcutaneous tissue, were initially considered to be the main source of lameness. However, as clinical signs progressed, several other more likely causes of lameness were identified. The grade of lameness did not improve after the surgical removal of the foreign bodies and, despite a regime of rest, local and general administration of antibiotics, and fixation of the limb in a cast bandage, there was a gradual deterioration of lytic changes on the distal metacarpus and the first phalanx. On day 16 of hospitalization, a newly formed cyst-like lesion in the proximo-medial phalanx region was radiologically detected. The bone adapts to biomechanical stress by a repeated replacement of the damaged bone with new growth. In our patient the trauma must have been so severe that the process of replacement was suppressed and bone degeneration prevailed. Also in a report by Hanson et al. (1996), lytic bone changes appeared 16 days after the initial examination due to progressive bone loss. Although it is stated that the most common source of damage to the subchondral bone and articular cartilage is repeated hyperextension of the fetlock joint at high speed leading to bone weakening and cumulative damage, even a single severe trauma can initiate so-called non-osteochondral cysts, where it is hypothesized that trauma causes local subchondral ischaemia or pressure necrosis (Verschooten and DeMoor 1982) leading to irreversible bone damage. In our patient, we also lean toward to the possibility of a single trauma as the main aetiological factor in the development of pathological changes, as the horse had been used only for light work for several years. The patient's condition did not improve even after more than two weeks of therapy; the horse's owners did not want to continue with further diagnostics and treatment, and so the horse was euthanized. Subsequently, a *post mortem* CT examination and necropsy of the affected limb were performed.

CT imaging of the distal metacarpus in the sagittal plane enabled a better identification of the pathological changes. On CT examination, the extent of the damage to the

metacarpus and the first phalanx seemed more severe than on X-ray scans. A limiting factor of a CT examination would be the limited evaluation of the extent of damage to articular cartilage. CT examination of our patient would most likely have revealed the extent of the subchondral bone damage sooner, but CT for horses is not yet available in the Czech Republic and the examination abroad was refused by the owners. Pathomorphological examination of the affected fetlock area revealed several types of degenerative joint changes of various ages. According to the evaluation of the articular surface of the fetlock joint in the study by Kawcak et al. (2008), wear-lines and cartilage erosion in our patient were of the most severe grade (more than 5 wear-lines, partial-thickness erosion exceeding 5 mm in diameter and full-thickness erosions). The presence of wear-lines is thought to be a symptom of early pathological changes in the joint surface and also occurs in mildly osteoarthritis-affected joints. According to the findings, our patient could have manifested older arthritic changes. On the other hand, the progression of cartilage erosion on the metacarpal condyles did not occur until during hospitalization (progressive osteolysis seen on X-rays). The pathology of the palmar part of the metacarpal condyles was identified only by discolouration of the subchondral bone when, according to Barr et al. (2009), it is described as a low grade POD (palmar osteochondral disease). The most serious finding of the patho-morphological examination and, in our opinion, the very cause of severe lameness was a traumatically formed cyst-like lesion in the first phalanx. Insufficient reaction to the simple intra-articular fetlock joint anaesthesia would correspond to this, as it was a deep subchondral bone pain. Despite the fact that the horse was not physically overloaded for a long time (a short racing career followed by recreational riding), X-ray and CT examination and limb autopsy revealed serious changes in the articular cartilage and subchondral bone of the first phalanx and distal metacarpus, so severe acute trauma is considered to be the most probable cause of the lameness. The possible connection between the foreign bodies and pathological changes on the articular surface of the fetlock joint also remains a question. The thorns probably travelled in the subcutaneous tissue for some time and only after their anchoring and the development of severe subcutaneous inflammation were they accidentally discovered. In conclusion, the combination of traditional diagnostic methods – clinical, radiological, ultrasonographic and more advanced imaging methods (CT) used in a case of multifactorial lameness coming from the fetlock area did not lead to the detection of all pathologies, which could only be confirmed *post mortem* by necropsy.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgement

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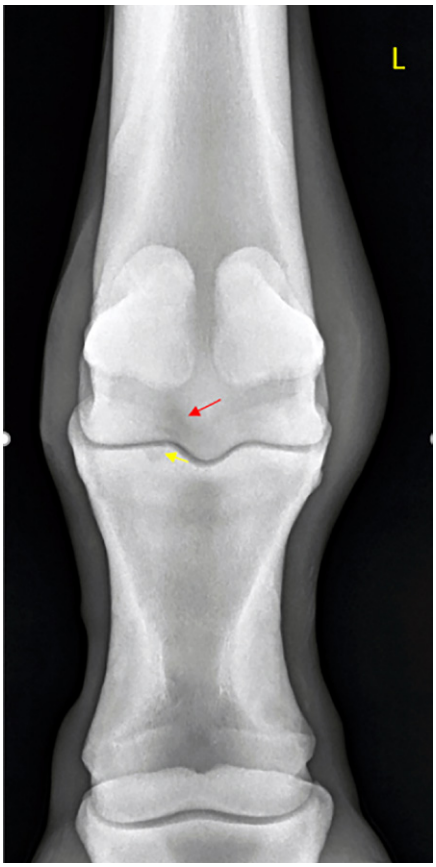

Fig. 1. Radiograph of the left fetlock joint at the time of admission, D15Pr-PaDiO view, lateral to the right. Radiolucent area in the metacarpus (McIII) (red arrow) and radiolucent area with sclerotisation in the subchondral bone plate of the first phalanx (yellow arrow).

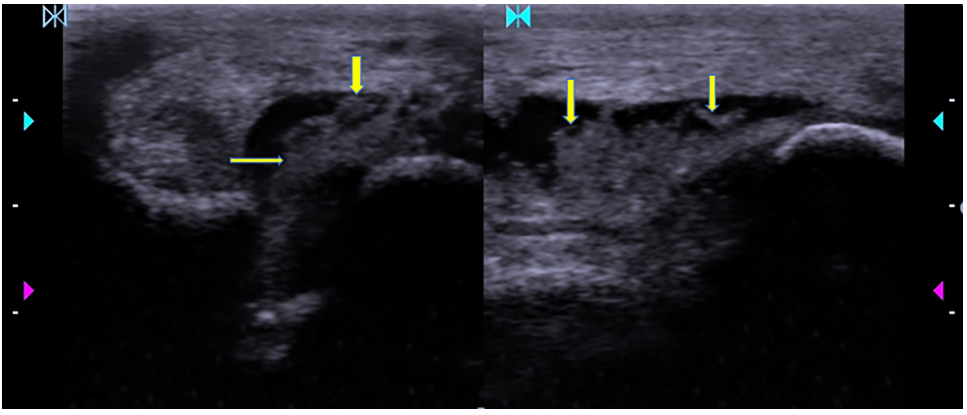

Fig. 2. Ultrasonographic image of the lateral recess of the left fetlock joint with the thickening of the synovial membrane (yellow arrows). A) Transverse image, medial to the left; B) Linear image, proximal to the left.

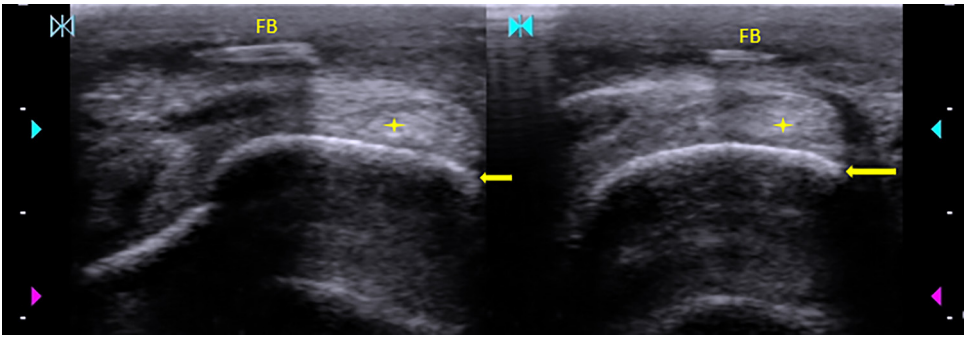

Fig. 3. Ultrasonographic transverse image of the dorso-lateral aspect of the fetlock joint image, medial to the left. Foreign bodies (FB) with an acoustic shadow in the proximity of the lateral digital extensor tendon (star) and the lateral condyle of McIII (arrow) surrounded by probable necrotic tissue (dot).

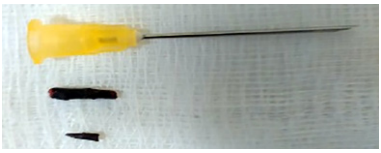

Fig. 4. Foreign bodies (thorns)

Fig. 5. Radiographs of the left fetlock joint on day 4 post surgery, dorso-15°-proximo-palmarodistal oblique (D15Pr-PaDiO) view, lateral to the right. Radiolucent area visible in the MtcIII (yellow circle) and the first phalanx and Mtc III (red circle).

Fig. 6. Radiographs of the left fetlock joint, dorso-10°-proximo-palmarodistal oblique (D10Pr-PaDiO) view, lateral to the right. A cyst-like lesion visible in the first phalanx (red circle) and radiolucent area in the distal part of the McIII lateral condyle (yellow circle).

Fig. 7. Multiplanar reconstruction image of the fetlock joint, dorsal plane, medial to the left. The image shows soft tissue swelling at the lateral aspect. Two large hypo-attenuating areas are seen in the subchondral bone of the metacarpal bone and the first phalanx (the opposing subchondral bone is irregular).

Fig. 8. Transverse image of the proximal phalanx, medial to the left. The largest hypo-attenuating area in the subchondral bone at medial aspect of the first phalanx is shown. The margins are irregular and small fissure lines towards the dorsal and palmar aspect are visible.

Fig. 9. Multiplanar reconstruction image of the fetlock joint in the sagittal plane, showing the same hypo-attenuating area in the subchondral bone of the first phalanx as shown in Fig. 8. The area is surrounded by sclerosis and the opposing subchondral bone is irregular and heterogeneous.

Fig. 10. Multiplanar reconstruction image in the sagittal plane, showing hypo-attenuating area in the subchondral bone of metacarpal bone surrounded by sclerosis. This area corresponds to the same hypo-attenuating area in the subchondral bone of the lateral aspect of the distal metacarpus (Fig. 11).

Fig. 11. Transverse image of the distal metacarpus, lateral to the left. The largest hypo-attenuating area in the subchondral bone at lateral aspect of the metacarpus and smaller hypo-attenuating area in subchondral bone at medial aspect, just beside the sagittal ridge, are shown.

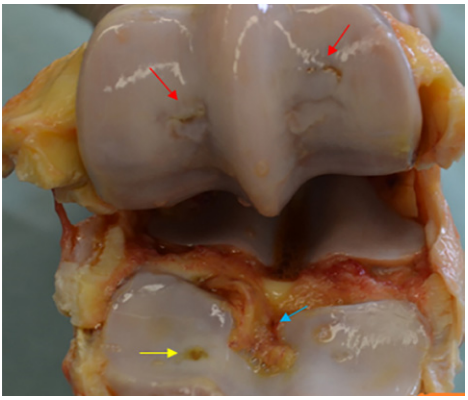

Fig. 12. Left fetlock joint, medial to the left, proximal to the top. Cartilage ulcerations of the lateral and medial McIII condyle (red arrows), oval cartilage lesion of the first phalanx (yellow arrow) and pannus (blue arrow) are visible.

Fig. 13. Distal McIII joint surface, medial to the left, dorsal to the top. Wear lines in the joint cartilage (red arrows) are obvious. Cartilage lesions in McIII condyles are without subchondral bone discolouration.

Fig. 14. Left fetlock joint, medial to the left. Cartilage lesion medially from the sagittal groove of the first phalanx is present.

Fig. 15. Lateral aspect of the left forelimb fetlock region. A cut cyst-like lesion with a bone fragment inside the first phalanx.

Fig. 16. Dissected fetlock joint, McIII dorsally, phalanx bone ventrally, palmar to the left, dorsal to the right. The area of the McIII medial condyle damage corresponds to the cyst-like lesion in the first phalanx.