Desmitis of the straight sesamoidean ligament and avulsion fragments of the proximal eminence of the middle phalanx in a horse imaged by radiographs, ultrasound, CT and MRI. A case report

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Key words: Equine, straight distal sesamoidean ligament, magnetic resonance imaging, computed tomography

Summary: Objective: Description of the signalment, history, clinical signs and radiological findings of a horse with an acute severe lameness. Radiographs, ultrasonographic, CT and MRI images were taken to visualize the exact lesion. Material and methods: Based upon the history, clinical examination and diagnostic anaesthesia the region of pain was suspected to be the palmar aspect of the pastern joint region. After radiographic and ultrasonographic examination, CT and MRI were performed. A desmitis of the straight distal sesamoidean ligament and avulsion fragments from the proximal eminence of the middle phalanx (medium scutum) were diagnosed. Results: The horse was treated conservatively with oral administration of non-steroidal anti-inflammatory drugs and submitted to a controlled exercise program. Within two weeks significant improvement was evident. After three months the horse had improved both clinically and on the views obtained by ultrasonography. A year later the horse was sound and had returned to his previous athletic level. Conclusion and clinical relevance: This case demonstrates the additional value of CT combined with MRI to a clinical examination and standard diagnostic imaging tools. After clinical, ultrasonographic and radiographic examination the tentative diagnosis was a cyst-like lesion in the proximal region of the pastern joint. The ultrasonographic examination revealed an irregularity in shape and fibre lining of the straight sesamoidean ligament. However, no conclusions were made at this point, since ultrasonography of this region is difficult, and conclusions are hard to be made (4, 6, 7, 9). Arthroscopic diagnostic evaluation of the joint was optional; however, uncertainty remained on the exact localisation of the cyst-like lesion. Based on the CT and MRI it became clear that the horse was suffering of a desmitis of the straight distal sesamoidean ligament and extra-articular avulsion fragments from the proximal border of the middle phalanx. Surgical intervention seemed to be unnecessary, and a conservative treatment was initiated with a successful outcome.

Schlüsselwörter: Pferd, gerades distales Sesambeinband, Kernspin- tomographie, Computertomographie


Desmitis des geraden distalen Sesambeinbandes und Avulsionsfragmente im proximalen Bereich des Kronbeins bei einem Pferd – Darstellung mittels Röntgen, Sonographie, CT und MRT. Ein Fallbericht Tierärztl Prax 2007; 35 (G): 63-68

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Introduction

The straight distal sesamoidean ligament together with the oblique, cruciate and short sesamoidean ligaments functions as the distal part of the suspensory apparatus of the metacarpophalangeal joint and the metatarsophalangeal joint, respectively (2). All distal sesamoidean ligaments originate from the base of the proximal sesamoid bones and the intersesamoidean ligament. The straight distal sesamoidean ligament inserts at the proximal eminence of the middle phalanx i.e. the middle scutum, whereas the other distal sesamoidean ligaments insert on the proximal phalanx (2). The branches of the superficial flexor tendon insert at the middle scutum abaxial to the insertion of the straight sesamoidean ligament (2).

A few authors have described clinical cases of desmitis of the straight distal sesamoidean ligament (4, 7, 9). Ultrasonography is the generally accepted diagnostic technique to visualize these pathologies (4, 7, 9). In sound horses a hypoechoic area in the distal part of the straight sesamoidean ligament can be seen that is easily misinterpreted as a pathological finding (4, 6, 7, 9). Sometimes additional diagnostic tools like magnetic resonance imaging (MRI) or computed tomography (CT) are indicated if radiographs and ultrasonography of the pastern are inconclusive. Schneider et al. (9) described nine patients with desmitis of the straight distal sesamoidean ligament. In all cases no abnormalities were found on radiographs. The diagnosis was based on: ultrasonography (all cases and all compared with control sound horses), scintigraphy (four cases) and MRI (two cases).

The purpose of the case reported here was to describe the clinical features of a patient with desmitis of the straight distal sesamoidean ligament and avulsion fragments of the proximal eminence of the middle phalanx. Due to the use of a large variety of diagnostic imaging techniques (radiographs, ultrasonography, MRI and CT) it was possible to fully identify the exact lesions, with a good therapeutic plan and a successful outcome as result.

Case history

Signalment and history

In May 2005 a 10-year-old Andalusian gelding was presented to the Department of Equine Sciences for evaluation of a left front limb lameness. The horse had been severely lame for three weeks with an acute onset. The local veterinarian concluded that the lameness originated from the lower part of the left front limb based upon a positive response to a digital palmar nerve block. Radiographs were taken, but showed no abnormalities. A pododerma-titis was suspected, and the horse was treated with a wet hoof bandage for three days and box stall rest. As the horse did not improve at that stage, further examination was indicated. Intra-articular anaesthesia of the distal interphalangeal joint gave a positive response. A nonseptic traumatic arthritis was suspected, and the distal interphalangeal joint treated with intra-articular steroidal drugs (Dexadreson1). However, all treatments had no effect on the lameness. The lameness had not changed over the three weeks period of time.

The horse was used on recreational dressage level.

Clinical findings

On admission, the lameness was assessed as grade 3 out of 5 and was classified as supporting limb lameness (8). The pastern region of the lame limb was swollen and painful on palpation, especially the axial part of the palmar aspect of the pastern joint region. Flexion of the distal limb was painful, whereas rotation did not exacerbate the lameness. Examination of the hoof did not reveal any abnormalities. A low digital palmar nerve block with alfacaïne2 resolved the lameness. Radiographs were taken of the distal part of the limb (dorsopalmar view and lateromedial view). On the dorsopalmar view (DP), a cyst-like lesion was detected at the proximal aspect of the middle phalanx (fig. 1). This cyst-like lesion was not visible on the lateromedial view (LM).

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1. Dexadreson, Intervet, Boxmeer, The Netherlands
2. Alfacaine 2%, Pharmalux, Borgerhout, Belgium
The following day, the lameness had not changed. An intra-articular anaesthesia (lidocaine) of the proximal interphalangeal (PIP) joint was performed. There was no response after five minutes, but 10 minutes after intra-articular anaesthesia a 40% decrease of the lameness was present, with no further improvement of the lameness after prolonged blocking time.

Based on these findings additional changes in the soft tissue surrounding the joint were suspected. Ultrasonography of the palmar aspect of the pastern was performed with special interest to the insertion of the branches of the superficial digital flexor tendon (SDFT) and the straight distal sesamoidean ligament (SSL) on the middle phalanx. Ultrasonography was performed with a high-definition ultrasound system equipped with a curved linear array (5–8 MHz) after preparation of the region of interest. The straight distal sesamoidean ligament showed an increase in cross-sectional area and a core-defect with loss of longitudinal fibre lining (fig. 2). At the insertion of the straight distal sesamoidean ligament to the proximal eminence of the middle phalanx an irregular lining of the bone was suspected. Next to that, small-calcified structures were identified in the straight distal sesamoidean ligament, which were thought to be avulsion fragments of the middle phalanx. Since the exact location of the cyst-like lesion was not evident and the relation of the cyst-like lesion with the suspected abnormalities found during ultrasonography, additional diagnostic imaging was indicated. A combination of CT with MRI was decided, because CT could provide only detailed information on the bony structures whereas MRI could give more information on the surrounding soft tissues.

**CT and MRI**

CT and MRI examinations of the distal left front limb in the region of the PIP joint were performed under general anaesthesia. The left front limb was positioned in the gantry of a single slice helical CT (Philips Secura, Philips NV, Eindhoven, The Netherlands) and 1-mm-thick contiguous slices were acquired, with 120 kV and 260 mA. Images were reconstructed using a bone algorithm and stored as DICOM images for further processing.

The CT examination showed a radiolucent defect in the proximal-palmar aspect of the middle phalanx, slightly laterally to the midline, at the level of the attachment of the straight distal sesamoidean ligament (fig. 3). Small bony fragments were also seen at this level.

MRI images of the distal limb were acquired using a flexible ring coil in a 0.2 T magnetic field (Siemens Open Magnetom). MRI images were obtained in two orthogonal projections (sagittal and transverse). Sequences used included spin echo (SE) and turbo spin echo (TSE). SE sequences used were T1-weighted (TE = 15 ms, TR = 560 ms); TSE sequences were proton density (PD) (TE = 26 ms, TR = 4080 ms) and T2 weighted (TE = 106 ms, TR = 4080 ms).

The MRI examination showed an increased and abnormal signal on the lateral aspect of the straight sesamoidean ligament, proximal to its insertion on the second phalanx (fig. 4). The cyst-like defect was also seen on the proximo-palmar aspect of the second phalanx.

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3 Lidocaine HCL. B. Braun 2%, B. Braun Melsungen AG, Melsungen, Germany
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**Fig. 3** CT 3D surface rendering reconstruction of the phalangeal bones. a: proximal phalanx, b: middle phalanx, c: navicular bone, d: third phalanx. The subchondral defect is visible on the palmaro-proximal aspect of the middle phalanx (black arrow). CT facilitates exact localization of the lesion. The small bony fragments are lost in this view due to the reconstruction technique.

**Fig. 4** MRI sagittal slice of the pastern of the left front limb. a: proximal sesamoid bones, b: branches of the superficial flexor tendon, c: abnormal signal in the straight distal sesamoidean ligaments, d: middle scutum. MRI facilitates identification of the soft tissues and their lesions.

**Fig. 5** Control ultrasonographic image of the straight distal sesamoidean ligaments after one year of exercise program. Mild improvement of the longitudinal fibre pattern of the distal portion of the straight sesamoidean ligament is seen as compared to the previous examination (white arrow). Persistent hypoechoic pattern of the ligament is still present at this level (a). The bony contour of the proximal aspect of the middle phalanx is smoother as compared to the first ultrasound (dotted arrow).

**Therapy**

Conservative treatment with box stall rest and non-steroidal anti-inflammatory drugs (meloxicam 0.6 mg/kg bwt per os q 24 h*) were selected. The owner was advised to give the horse box rest the first month, the second month box rest and handwalking exercise for five minutes per day and the third month box rest and handwalking exercise for 10 minutes.

After three months the horse showed significant improvement: the lameness had improved to grade 1 out of 5. Palpation of the palmar aspect of the pastern was no longer painful. Furthermore, a control ultrasonographic examination showed an increase in fibre lining and a normal cross sectional area of the straight distal sesamoidean ligament, but the irregular lining of the proximal border of the middle phalanx was still evident.

The horse was again subjected to box stall rest and a handwalking exercise program for another three months with incremental increase in time. After six months the horse was sound, and training was resumed. One year after the initial lameness the horse had resumed his previous athletic level. The owner presented the horse for re-evaluation. Ultrasonographs and radiographs were taken. On the radiographs the contour of the cyst-like defect of the proximal border of the middle phalanx was less defined but still irregular, whereas ultrasonography revealed an almost filled defect of the straight sesamoidean ligament and remodelling of its longi-

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4 Metacam Paard, meloxicam, Boehringer Ingelheim, Alkmaar, The Netherlands
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Tudinal fibre lining (fig. 5). The avulsion fragments of the border of the proximal eminence had resolved, as they were no longer visible on ultrasonographic images.

Discussion

Historically, lameness that significantly improved after a palmar digital nerve block was considered to originate from the palmar one-third of the foot (11). Multiple studies have been conducted since then to determine a lameness protocol and create a standardised approach to lameness examination (1). In the study by Schumacher et al. (10) the effect of palmar digital nerve (PDN) blocks on pain from the proximal interphalangeal joint was evaluated. The PDN blocks were performed in three different locations, starting as low as possible in the pastern just above the hoof cartilages and 1 or 2 cm proximal to this location. The authors found that the lower the anaesthesia was performed, the less likely it was that the nerve block had influenced the lameness originating from the PIP joint. However, in some cases the PDN block had influenced the lameness regardless of the location of the PDN block. Resulting from this article, anaesthesia of the lower part of the limb is inconclusive and careful interpretation of the findings regarding diagnostic anaesthesia is warranted (1, 10, 11).

In the presented case, the horse responded to a PDN block as the lameness resolved completely, whereas blocking of the PIP joint only gave a 40% decrease of the lameness after 10 minutes. Since the response to the PIP joint block was delayed and limited (40%), it was less likely that the joint was involved. However, the involvement of the joint could not be excluded based upon these findings. Ross (8) described a guideline on which lameness examination and subsequently anaesthetic blocks can be judged. In general, anaesthesia of a joint can have a false positive or a false negative response (1, 8). The sooner the effect after anaesthesia of the joint is present, the more likely the involvement of the joint in the lameness origin is (1, 8).

The 100% response to the PDN block might have been due to direct diffusion of the anaesthetic fluid to the affected area or by lymphatic or venous transport of the anaesthetic solution more proximally than it was injected (1). Taking into account that in the presented case the proximal region was swollen, and therefore a decreased integrity of the interstitial space might have contributed to the diffusion of the anaesthetic fluid injected as a PDN block. The positive response to anaesthesia of the DIP joint performed by the local veterinarian might be based on diffusion like the PDN block in this case or as Ross (8) mentioned a false positive response.

For an exact localization of a lesion on radiographs at least two radiographic directions of the affected area are needed (11). In our case radiographic views in DP and LM projections were made, where only on the DP projection the cyst-like lesion was visible. Oblique views are generally used for evaluation of the abaxial lining of the joint region. As the cyst-like lesion in the presented case was located in the axial part of the PIP joint region, it was concluded that on oblique views the lesion would have been over-projected and the additional value of these oblique directions was thought to be limited. Other diagnostic imaging, like CT, was indicated to fully identify the cyst-like lesion and its location.

Ultrasonographic viewing of the straight distal sesamoidean ligament can be rather difficult to perform and interpret (6, 7, 9). In the distal part of the straight distal sesamoidean ligament a hypoechoic area is seen in normal horses that is easily misinterpreted as a pathological finding (4, 6, 7, 9). In the presented case ultrasonography of the lateral region indicated pathological abnormalities, but MRI was necessary to confirm our suspicion of the ongoing pathologies of the soft tissues.

After radiographs and ultrasonographs a cyst-like lesion in the region of the PIP joint was suspected. At this stage arthroscopic evaluation of the joint could have been of additional value. However, this joint is difficult to approach (5) since the joint is surrounded with ligamentous tissue and vulnerable structures like nerves, vessels and tendon (sheets). In addition, it is a joint with a low range of motion, making the joint cavity rather small. In our diagnostic challenge, CT and MRI were thought to have less impact on the patient compared to arthroscopic evaluation of the PIP joint and were therefore chosen. After CT and MRI, arthroscopic evaluation of the PIP joint was no longer indicated as a definitive diagnosis could be made and involvement of the joint was excluded.

Injury to the straight distal sesamoidean ligament has been described as occurring comparatively rarely (7, 9). All types of horses are represented, but performing horses are more likely to suffer from this disease. A long controlled exercise program is the first choice of therapy with control ultrasonographic examinations every three months. Overall it usually takes at least six months of controlled exercise program before healing is completed (7, 9). In the study by Schneider et al. (9) tendonsplitting was used as an option of treatment; in three out of four cases this gave a successful result. In general, horses with mild injuries might fully recover, but more severely injured horses or horses with multiple tendinosus or ligamentous injuries have a more guarded prognosis, as recurrence of the injury is rather common (7).

In the presented case the horse showed significant clinical improvement after two weeks of complete box stall rest and oral administration of anti-inflammatory drugs. The horse was submitted to a controlled exercise program for six months, after which the horse resumed training.

Practical conclusions

The presented case demonstrates the additional value of CT combined with MRI to a clinical examination and standard diagnostic imaging tools. CT and MRI increasingly play a role in lameness examination (7, 9, 12). Radiography and ultrasonography are more routinely used diagnostic tools, but in selected cases more advanced diagnostic tools are indicated. Whitton et al. (12) mention combining MRI and CT in cases where radiographs and ultra-
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