Pferdeheilkunde 12 (1996) 4 (Juli August) 613–616

Injuries of the accessory ligament of the superficial digital flexor tendon (proximal check ligament) in sport and race horses

J.-M. Denoix, I. Guizien and *P. Perrot*

Ecole Nationale Vétérinaire d'Alfort, Clinique équine – INRA – Laboratoire d'Anatomie, Maisons-Alfort Cedex, France

Summary

The purpose of this study is to present 32 clinical cases in which spontaneous injury of the accessory ligament of the superficial digital flexor tendon (AL-SDFT; proximal check ligament) was established ultrasonographically.
On these horses the medial aspect of the distal antebrachium and the carpal canal were investigated ultrasonographically because of abnormal findings obtained during physical and dynamic examination and/or positive nerve blocks.
The diagnosis of AL-SDFT desmopathy was established when thickening and alteration of echogenicity were present. This injury affected mainly young adult horses with high level of physical activity. In 14 horses treatment consisted in carpal sheath injection of hyaluronic acid and corticosteroids associated with rest. Out of the 13 sport horses included in this study, 8 (62%) were able to return to their previous level of physical activity; out of the 16 race horses, 7 (44%) returned to racing at their previous level.
Desmopathy of the AL-SDFT must be suspected in athletic horses presenting a carpal canal syndrome or a proximal tendinitis of the SDFT.

Keywords: horse, tendon, ultrasonography, accessory ligament, superficial digital flexor tendon

---

Verletzungen des Unterstützungsbandes der oberflächlichen Beugesehne bei Sport- und Rennpferden

In dieser Studie werden 32 klinische Fälle präsentiert, bei denen mittels Ultraschall eine spontane Verletzung des Unterstützungsbandes der oberflächlichen Beugesehne (accessory ligament of the superficial digital flexor tendon; proximal check ligament) diagnostiziert wurde.
Bei diesen Pferden wurde eine ultrasonographische Untersuchung der medialen Ansicht des distalen Unterarms und des Karpaltunnels durchgeführt, nachdem in der klinischen Untersuchung, in der Bewegung oder bei der diagnostischen Anästhesie abnormale Befunde aufgetreten waren.
Die Diagnose „Desmopathie des Unterstützungsbandes der oberflächlichen Beugesehne" wurde gestellt, wenn eine Verdickung und Veränderung der Echogenizität festgestellt wurden. Diese Verletzung trat hauptsächlich bei jungen Pferden mit hoher körperlicher Aktivit auf.
14 Pferde wurden mittels Injektion von Hyaluronsäure und Kortikosteroiden in die Karpal-Sehnenscheide und anschließender Ruhephase behandelt. Von den 13 Sportpferden in dieser Untersuchung konnten 8 (62%) ihre frühere körperliche Aktivität wieder aufnehmen; von den 16 Rennpferden erreichten 7 (44%) wieder ihr früheres Leistungsniveau.
Bei Sportpferden, die ein Karpaltunnelsyndrom oder eine Entzündung der oberflächlichen Beugesehne im proximalen Bereich zeigen, muß immer eine Desmopathie des Unterstützungsbandes der oberflächlichen Beugesehne in Erwägung gezogen werden.

Schlüsselwörter: Pferd, Sehne, Ultraschall, Unterstützungsband, oberflächliche Beugesehne

Introduction

Injuries of tendons and ligaments are common in sport and race horses and are well known and documented in the metacarpal and digital areas. In the last 10 years surgical desmotomy of the accessory ligament of the superficial digital flexor tendon (AL-SDFT; proximal check ligament) has been presented and developed as a treatment for superficial digital flexor tendinitis (*Bramlage* 1986).
Spontaneous injuries of the AL-SDFT have rarely been reported in the literature. A radiographic diagnosis of strain of this structure at its attachment to the radius was made by *Lingard* (1966) in a 5 year-old Arabian stallion. In a retrospective study of 45 clinical cases examined ultrasonographically in the carpal region, *Denoix* and *Audigié* (1993) reported 7 cases of AL-SDFT desmopathy. The ultrasonographic diagnosis of spontaneous injuries of the AL-SDFT has recently been presented in 23 horses (*Denoix* et al. 1995).
The purpose of this study is to present 32 clinical cases in which spontaneous injury of the AL-SDFT was established in conjunction with clinical examination, radiography and ultrasonography. It is also to attract attention to this undocumented soft tissue injury of the carpal canal in sport and race horses.

Materials and methods

In order to establish reference images of the AL-SDFT, 7 sound adult horses without history of lameness were used to obtain normal transversal and longitudinal (frontal and sagittofrontal) ultrasound scans of the AL-SDFT; these scans were compared to transversal and longitudinal anatomical sections of 7 normal frozen injected limbs, to transversal and longitudinal Magnetic Resonance Imaging (M.R.I.) scans performed on 3 normal isolated limbs and to 4 especially dissected specimens.
On 15 horses presented for forelimb lameness, complete physical examination (observation and palpation of the palmaromedial aspect of the carpus and proximal metacarpus) and dynamic examination on straight line and circles, on hard and soft surfaces, with dynamic flexion tests were performed. Positive antebrachial or proximal metacarpal nerve blocks were obtained in 4 of these

patients. Seventeen other horses were referred for ultrasonographic examination of the proximal metacarpus or palmaromedial aspect of the carpus because of distension of the carpal canal or proximal metacarpal tendon injury.

On all the thirty-two sport and race horses included in the study, the medial aspect of the distal antebrachium and the carpal canal were investigated ultrasonographically.

The ultrasound scans were made with a semiportable machine (SIEMENS LM) or non portable machines (ALOKA 1200 and ALOKA 2000) and 7.5 MHz linear or a 10 MHz sector probes. A standoff pad was placed between the skin and probe in order to improve contact with the limb and to enhance visualisation of superficial structures. The skin of the area was clipped distally and cranially to the chestnut at the medial aspect of the distal antebrachium, and at the palmaromedial aspect of the carpus. All the longitudinal and transverse ultrasound scans were recorded on 3/4 inch U-Matic videotapes to allow complete retrospective analysis.

Follow up information was obtained on phone calls for 31 horses.

Results

Imaging findings

Comparison was made between ultrasound scans of the distal antebrachium of sound limbs and anatomical sections, M.R.I. scans as well as dissected specimens. It allowed us to establish the reference ultrasonographic images of the AL-SDFT in the horse. The chestnut usually does not alter the image of the proximal portion of the AL-SDFT. The normal AL-SDFT is homogeneously echogenic and is located between the radius cranially, the distal tendon of the flexor carpi radialis as well as the median vessels and nerve medially, and the junction between the body and the tendon of the superficial and deep digital flexor muscles caudolaterally (Fig.1).

Abnormal ultrasonographic findings within the AL-SDFT were identified in all the horses included in the study (Fig. 2). They include thickening, hypoechoic images, alteration of the fiber pattern and altered margins. They can be documented on transverse sections performed from the chestnut to the accessory carpal bone as well as on longitudinal sections passing through the flexor carpi radialis tendon or the median artery. They were found in 20 left and 12 right forelimbs.

These injuries were accompanied by several abnormal findings involving structures of the carpal canal, including synovial effusion within the proximal and distal recesses of the carpal sheath in 16 horses, concomitant injuries of the superficial digital flexor tendon itself in 10 horses, tenosynovitis of the flexor carpi radialis in 3 horses, proximal third interosseus muscle (TIOM) injury in 2 horses, and distension or thickening of the retinaculum flexorum in 2 horses.

Eighteen horses were also examined radiographically and in fourteen of them the radiographs were normal. Abnormal profile of the caudal aspect of the distal radius was found or suspected in 3 cases. In 1 case osteochondroma of the distal radius was removed previously and 1 case presented remodeling at the proximal insertion of the AL-SDFT.

Clinical data

Desmopathy of the AL-SDFT affected mainly young adult horses with high level of physical activity. Sixteen of the injured patients were race horses (10 trotters and 6 gallopers) and were between 2 and 10 years old; 13 were sport horses (jumpers, dressage and three-day-event horses) and were between 4 and 15 years old. The 3 injured pleasure horses were between 10 and 15 years old.

Clinical manifestations usually consisted in lameness and local signs. The onset of lameness was reported sudden in 17 horses, progressive in 3 horses, intermittent in 4 horses and unknown in 8 horses. The initial grade of lameness was reported mild (7 horses), moderate (7 horses) or severe (6 horses). The ultrasonographic examination was usually performed because of the presence of local physical abnormal findings: synovial fluid distension of the carpal canal sheath was identified or suspected in 16 horses; proximal superficial digital flexor tendon or palmar metacarpal enlargement was present in 9 horses; diffuse swelling of the carpus was present in 5 patients. Two horses presented also a proximal interphalangeal joint instability. Only 2 horses did not present any local clinical signs.

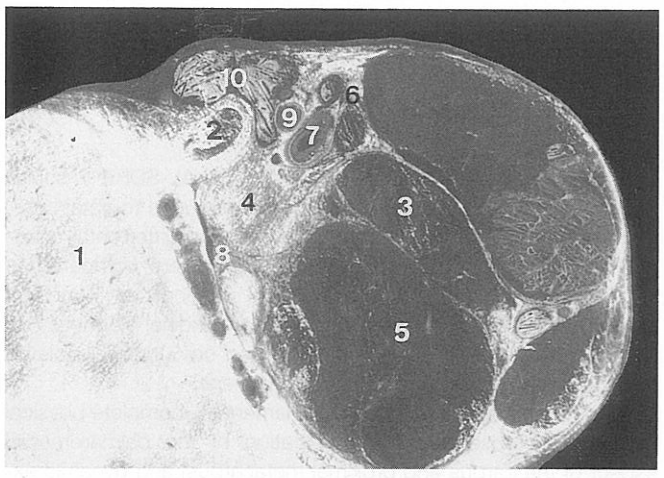

Fig. 1: Ultrasonographic anatomy of the AL-SDFT.
Fig. 1a: Transverse anatomical section performed 4 cm proximally to the accessory carpal bone.

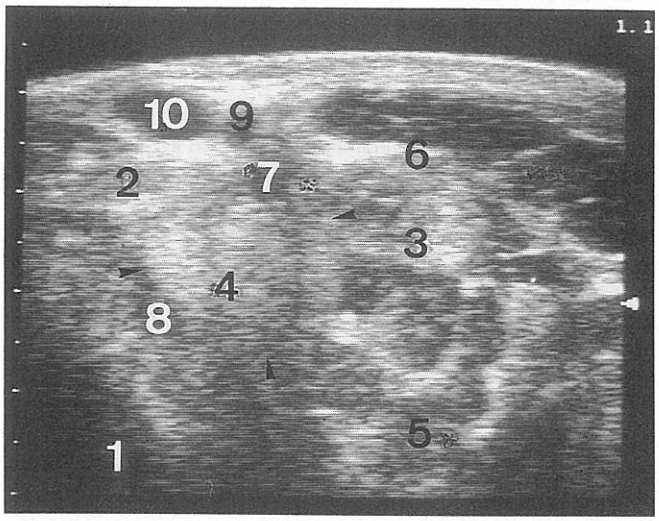

Fig. 1b: Corresponding transverse ultrasound scan of a normal distal antebrachium.
1. Radius; 2. Flexor carpi radialis muscle; 3. Superficial digital flexor muscle; 4. AL-SDFT; 5. Deep digital flexor muscle; 6. Flexor retinaculum; 7. Median artery; 8. Carpal canal; 9. Radial artery; 10. Cephalic vein.

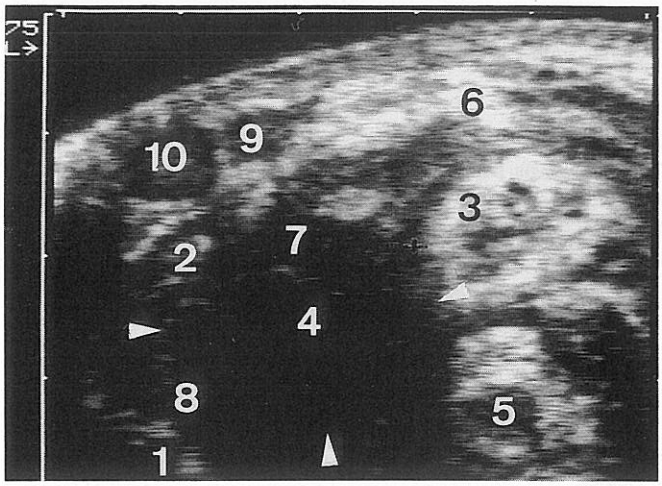

Fig. 2: Transverse ultrasound scan of the distal antebrachium in a horse with an injury of the AL-SDFT.
1. Radius; 2. Flexor carpi radialis muscle; 3. Superficial digital flexor muscle; 4. AL-SDFT; 5. Deep digital flexor muscle; 6. Flexor retinaculum; 7. Median artery; 8. Carpal canal; 9. Radial artery; 10. Cephalic vein.
On this clinical case with a right forelimb lameness, the AL-SDFT is terribly thickened and hypoechogenic. These findings are indicative of an accessory desmopathy.

Retrospective analysis

Follow up information was obtained on 31 horses. Six horses were taken out of use after the diagnosis of AL-SDFT injury, 2 of them for breeding. One horse died for a cause unrelated to the AL-SDFT injury.

Twenty four horses returned to their previous athletic activity (Fig. 3). In 14 of them treatment consisted in local injection of hyaluronic acid and corticosteroids within the carpal sheath associated with rest; 3 horses received systemic administration of non steroidal antiinflammatory drugs, 2 horses were blistered and 5 horses were only rested. Four horses returned to competition within 4 months after identification of the injury; 3 reinjured their AL-SDFT, SDFT or TIOM within this period, and one female was taken out of use for breeding. Ten horses resumed full athletic activity within 4 to 6 months; 2 of them reinjured their AL-SDFT at 6 months after identification of the injury and one injured its TIOM. Eight horses returned to normal activity within 6 to 9 months and 2 of them reinjured their AL-SDFT respectively 1 and 3 months after resuming their full athletic level. Three other horses returned to normal activity after 9 months and are still sound.

Out of the 30 horses who were still usable for the study (one died and one was lost of follow up), 15 were able to recover their previous level of activity after a minimum of a 4 months period of rest and training.

In the 13 sport horses included in the study, 1 died, 3 horses were taken out of use, 8 (62%) were able to return to their previous level of activity and one dressage horse dropped in level. Out of the 16 race horses, 2 horses were taken out of use, 9 horses (4 trotters and 5 gallopers) reinjured their AL-SDFT, or had additional injuries of the SDFT or TIOM within 6 months of training or racing (2 of them were able to race later), and 7 (44%) horses (including 2 horses who had reinjury) returned to racing and are still sound after a minimum of 6 months of competition.

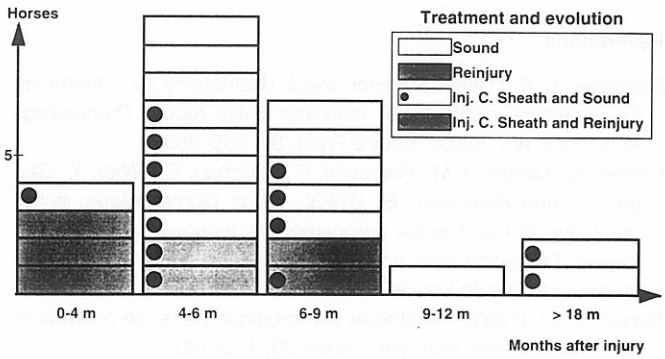

Fig. 3: Follow up information obtained on 24 horses who returned to their previous athletic activity. Inj. C. Sheath: horse treated with an injection of hyaluronic acid and corticosteroids within the carpal sheath.

Discussion and conclusions

On transverse ultrasound scan, identification of the normal or injured AL-SDFT is easier when the median artery and the flexor carpi radialis distal tendon are identified. The thick palmar fibrous wall of the carpal sheath, the flexor retinaculum, is in continuity with the antebrachial fascia and can be identified proximally to the accessory carpal bone.

The AL-SDFT is stretched during the mid-stance phase of the stride when the carpus, fetlock and proximal interphalangeal joints are simultaneously overextended (*Denoix* 1994). Besides, biomechanical studies demonstrated that the AL-SDFT is the weakest part of the SDF apparatus extended between the caudal aspect of the radius and the middle phalanx (*Crevier* et al. 1993). Thus, muscle fatigue inducing body weakness of the SDF muscle may be a biomechanical factor leading to AL-SDFT desmopathy.

This study demonstrates that spontaneous injury of the AL-SDFT does occur in race and sport horses. Ultrasonography allows an accurate diagnosis as well as follow up of this lesion. This technique revealed the relatively frequent occurence of this undocumented desmopathy in athletic horses.

As the AL-SDFT is in close relation with the carpal sheath, a positive proximal metacarpal nerve block (involving the palmar metacarpal and common digital nerves) is compatible with an injury of this ligament because of the possible diffusion of the anesthetic solution within the carpal sheath (*Denoix* 1995).

Ultrasonography appears to be essential for the differential diagnosis of carpal canal syndrome or for the diagnosis of soft tissue lesions after positive proximal metacarpal or antebrachial nerve blocks without radiographic abnormalities of the carpus or ultrasonographic injuries in the metacarpal area (*Denoix* 1993, 1995).

Indications for evaluation of the AL-SDFT in athletic horses include: carpal canal syndrome, proximal SDFT injuries, diffuse carpal swelling and evaluation of proximal metacarpal deformation. When an AL-SDFT desmopathy is diagnosed, complete evaluation of the area include assessment of proximal SDFT lesion, and proximal TIOM injury.

In our study more sport horses (62%) were able to return to their previous level of physical activity, without tendon reinjury after a minimum of 6 months of competition, than race horses (44%).

References

Bramlage, L. R. (1986): Superior check desmotomy as a treatment for superficial digital flexor tendinitis: initial report. Proceedings Ann. Conv. Am. Assoc. Equine Pract. 32, 365–369.

Crevier, N., Denoix, J. M., Pourcelot, P., Collobert, C., Ribot, X., Geiger, D. and *Bousseau, B.* (1993): Etude biomécanique, échographique et histologique comparée des tendons de la main du cheval: Evaluation des conséquences mécaniques des lésions tendineuses. World Equine Vet. Assoc., Swiss Vet. 3, 59–63.

Denoix, J. M. (1993): Anesthésie sémiologique nerveuse antébrachiale chez le cheval. Prat. Vét. Equine 35, 173–180.

Denoix, J. M. (1994): Functional anatomy of the tendons and ligaments in the distal limbs (manus and pes). Vet. Clin. North. Am.: Equine Pract. 10, 273–322.

Denoix, J. M. (1995): Anesthésie nerveuse métacarpienne proximale. Rec. Méd Vét, N° Spécial "Anesthésiologie du cheval" 171, 733–739.

Denoix, J. M. and *Audigié, F.* (1993): Examen échographique du carpe du cheval: lésions identifiées sur 45 cas cliniques. Prat. Vét. Equine 25, 193–203.

Denoix, J. M., Guizien, I. Perrot, P. and *Bousseau, B.* (1995): Ultrasonographic diagnosis of spontaneous injuries of the accessory ligament of the superficial digital flexor tendon (proximal check ligament) in 23 horses. Proceedings Ann. Conv. Am. Assoc. Equine Pract. 41, 142–143.

Lingard, D. R. (1966) Strain of the superior check ligament of the horse. JAVMA 148, 364–366.

Acknowledgements

This study was supported by the INRA (National Institute of Agronomic Research) and the Service des Haras (French National Horse Breeding Department of the Agriculture Ministery).

Many thanks to Benoît Bousseau for his technical assistance.

J.-M. Denoix
I. Guizien
P. Perrot

Ecole Nationale Vétérinaire d'Alfort
Clinique équine - INRA - Laboratoire d'Anatomie,
7, Avenue du Général de Gaulle
94704 Maisons-Alfort Cedex
France

Tel. (0033 1) 43 96 71 08
Fax (0033 1) 43 96 31 62