Ultrasonography in the Horse with Palmar Foot Pain: 13 Cases

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Introduction
Lameness that improves with a palmar digital nerve block may be associated with the coffin joint, navicular region, or palmar pastern. Ultrasonography as an aid in the diagnosis of abnormalities of the tendons and ligaments of the palmar pastern has been well described. Diagnosis of disease of the distal interphalangeal joint and navicular region is most commonly obtained on clinical examination and radiography. The anatomy and ultrasonographic appearance of the collateral ligaments of the distal interphalangeal joint have been briefly described. Desmitis of the collateral ligaments of the distal interphalangeal joint is rarely considered as cause of lameness. Clinical evaluation, radiography, and contrast radiography have been used to evaluate horses with suspected disease of the navicular region. The soft tissue structures within the hoof capsule, such as the deep digital flexor tendon and impar ligament, have not been directly evaluated. By employing the frog as a window, these structures may be examined with ultrasonography.

Materials and Methods
Records of 13 horses with forelimb lameness that improved with a palmar digital nerve block and had an ultrasonographic examination of the foot were reviewed. The mean age of the horses was 12 years. The breed distribution included Quarter Horse, Thoroughbred, Paint Horse, Warmblood, and Saddlebred. There were 4 females and 9 males. Duration of lameness ranged from 1 month to 4 years. Radiographs of the foot were obtained in all cases. Ultrasonographic examination was performed on the collateral ligaments of the distal interphalangeal joint and the structures within the hoof capsule on all cases. A 10 MHz linear array transducer was used to examine the collateral ligaments of the distal interphalangeal joint in the dorsal aspect of the pastern just proximal to the coronary band. The ligaments were imaged in the transverse and longitudinal planes. The cross-sectional area and sonographic appearance of the ligaments was compared with normal values obtained in a previous study. A 10 MHz microconvex...
linear array transducer\textsuperscript{a} was used on the ventral trimmed frog to examine the soft tissues and bone surfaces within the hoof capsule in transverse and longitudinal planes. The measurements obtained and sonographic appearance of the ligaments was compared with normal values obtained in a previous study.\textsuperscript{b}

**Results**

Of the 13 cases examined, 5 horses had abnormalities of one of the collateral ligaments of the distal interphalangeal joint (3 medial and 2 lateral) and 1 horse had both the medial and lateral ligaments affected. All ligaments had a cross-sectional area that was larger than the normal values obtained in a previous study. A hypoechoic core lesion was present in 5 ligaments and a mottled echogenicity in 2 of the ligaments. All ligaments with a core lesion had a disruption of the normal parallel fiber alignment on longitudinal section. All horses had a greater than 70\% improvement or complete resolution of their lameness following intra-articular anesthesia of the coffin joint. Radiographic findings included evidence of mild degenerative joint disease of the dorsal distal interphalangeal joint in 2 cases.

Of the remaining 7 cases, 4 had an irregular appearance to the flexor surface of the navicular bone. Three of these cases had hyperechoic protrusions from the surface of the navicular bone. Two of these horses had thinning and erosion of the flexor surface of the navicular bone and 1 horse had a fracture of the navicular bone on radiographic examination. One horse had an indentation in the flexor surface of the navicular bone on ultrasound and a lytic lesion of the navicular bone on radiographs.

Of the remaining 3 cases, 2 horses had a hyperechoic density imaged in the transverse and longitudinal plane in the deep digital flexor tendon just proximal to its insertion on the third phalanx. One of these horses had calcification of the deep digital flexor tendon on radiographs of the foot. One horse had hyperechoic densities in both the deep digital flexor tendon and the impar ligament. Radiographs revealed mineralization of the deep digital flexor tendon. Necropsy of this horse revealed calcification of the deep digital flexor tendon and impar ligament.

**Discussion**

The increased cross-sectional area and hypoechoic appearance of the collateral ligaments of the distal interphalangeal joint were compatible with desmitis and possible fiber tearing of the ligaments.\textsuperscript{3} Although damage to the collateral ligaments of the distal interphalangeal joint may be suspected on radiographic examination, only 2 of the 6 horses with ultrasonographic abnormalities of the collateral ligaments had abnormalities on radiographs.\textsuperscript{4} Ultrasound was more sensitive than radiographs in the diagnosis of desmitis of the collateral ligaments.

Ultrasoundography showed good correlation in this study with the radiographic appearance of the navicular, deep digital flexor tendon and impar ligament abnormalities. Because the frog is used as a window, abnormalities detected on ultrasound of the soft tissue structures within the hoof capsule and navicular bone are confined to the ventral and middle region of the foot.

**References and Footnotes**


\textsuperscript{a} Impact. Ausonics, Universal Medical Systems, Bedford Hills, NY.

\textsuperscript{b} Sage, AM and Turner TA. Unpublished data. March 2000.