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Ultrasonographic Studies on the Fetlock Suspensory Apparatus in Draught Horses

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SUMMARY

Suspensory injuries of the fetlock were studied ultrasonographically in 25 mixed breed draught horses. Sesamoiditis, fractures of the proximal sesamoid bones and proximal phalanx were the common radiography findings in the hard tissues. Ultrasonographic of soft tissues of the suspensory apparatus in the present study here showed multiple complicated structural injuries.

The suspensory branches showed desmitis, increased in size, dystrophic calcification, tearing, and fibrous echo dense material between the branch and the skin. Desmitis of the distal sesamoidean ligament had been seen associated with fractures of proximal phalanx and fractures of the sesamoid bones. Osteoarthritis of the fetlock joints was concomitant studied in the horses. Chronic desmitis of both the straight and oblique distal sesamoidean ligaments were encountered with hypoechoic core lesions in addition with irregularity of the bone surface echoes of the PI. Moreover, there were concurrent injuries to digital flexor tendons and the suspensory ligament as well as the distal sesamoidean ligaments in draught horses.

The present study showed that ultrasonographic examination was useful for assessing the profile of the suspensory apparatus abnormalities in draught horses. The characteristic abnormalities of suspensory apparatus reported in the present study showed multiple complicated disorders that would affect the prognosis of fetlock injuries.

INTRODUCTION

The fetlock joint is composed of hard and soft tissues; traumatic injuries to these structures are the common causes of lameness (Farrow 2006). The Suspensory ligament, the proximal sesamoid bones and the distal sesamoidean ligaments are the main

components of the fetlock suspensory apparatus in the horse (Stashak 2002). The long (straight), cruciate, short, and oblique sesamoidean ligaments attached to the basilar surface of each sesamoid bone and anchor them to the proximal/planter surface of the proximal phalanx.The function of suspensory apparatus is to support the fetlock and prevent its excessive extension (Getty, 1975).

The proximal sesamoid bones are part of the suspensory apparatus of the fetlock joint that prevents its hyperextension during strenuous exercise (Vanderperren and Saunders 2008). The elastic suspensory ligament and non-elastic distal sesamoidean ligaments exert tensile forces on the proximal sesamoid bones (Thompson and Cheung 1994). Studies on fractures of the proximal sesamoid bones have been described clinically and radiographically (Bukowiecki et al., 1985). Proximal sesamoid bones sesamoiditis may be associated with diseases of the soft tissues of the suspensory apparatus (Hardy et al., 1991).

The structural disease of the suspensory apparatus structures has been reported clinically and radiological (Haynes, 1980). The anatomical location and the architecture of the suspensory apparatus injuries are difficult to be identified by physical examination (Moyer and Raker, 1980). Ultrasonongraphy is routinely used for diagnosis and monitoring musculoskeletal injuries in horses (Genovese et al., 1986; Reef 1998; Vanderperren and Saunders 2008). Therefore, the aim of this study was to describe the ultrasonographic findings of the fetlock suspensory disorders in draught horses to establish an accurate prognosis of these affections.

MATERIALS AND METHODS

Twenty five mixed breed of draught horses were enrolled in this study they had lameness score at least 2 on a scale from 0 to 5 (American association of Equine Practitioners lameness scoring criteria were used). The mean age of horses was 6.2 (range 1-15 years) and mean duration of lameness was 28 days (40 -60 days). The mean body weight was 400 kg. (350–550 kg.). Clinical examination was performed on these horses which included palpation for soft tissues pain and swelling, evaluation at the walk and trot, evaluation of fetlock flexion test. Suspensory ligaments abnormalities were diagnosed based on clinical, radiographic and ultrasonographic findings.

Radiographs were routinely taken in the latero-medial and dorso-palmar views. Oblique views dorsolateral-palmaro/planter medial oblique and palmaro/plantero lateral-dorsomedial were taken. The radiographic examination was taken by mobile X-ray machine (Fischer). The radiographic setting factors were ranged from 50 to 58 kvp; 10 mAs and FFD was 90 cm.

Ultrasonographic examination of the palmar/planter aspect of the fetlock soft tissue structures was performed using a 7 MHz micro convex transducer with displayed depth 6 cm (just vision 200, Toshiba). Transverse and longitudinal scans were obtained. The limb was prepared by fine clipping, washing and liberal application of coupling gel. The fetlock soft tissue structures in all horses were examined ultrasonographically at three levels: Level (I) 4 cm above the proximal sesamoid bones. Level (II) at the level of the proximal sesamoid bones and level (III) distal to the sesamoid bones to mid first phalanx (PI).The contra lateral limb was also examined for comparison study.

RESULTS

Out of 25 horses, 19 showed lameness. The others 6 animals revealed lameness after flexion tests of the fetlock joint. Chronic digital flexor tendon tendonitis and suspensory ligament desmitis had been observed in these horses. Five horses were affected in hind limbs and two horses in both fore limbs. A single fore limb involvement was seen in 18 horses.

Radiographic evaluation revealed no osseous radiographic abnormalities were detected in five horses. Chronic digital flexor tendon tendonitis and suspensory ligament desmitis were seen in four horses and septic tenosynovitis in one horse. The observed radiographic changes in the proximal sesamoid bones comprised sesamoiditis (9 horses), non articular new bone growth (enthesiophytes), osteolytic defects and dystrophic mineralization at the palmar/planter surfaces of the proximal sesamoid bones were noticed. The proximal sesamoid bones apical fracture was seen in 2 horses and mid body transverse fracture in one horse. Distal sesamoidean ligaments desmitis were diagnosed in the fore limbs in five horses. Enthesiophytes formation at the base of proximal sesamoid bones and at the attachment of oblique distal sesamoidean ligaments at the palmar, planter, medial and lateral aspects of the proximal phalanx were the consistent findings. In addition, fracture of the proximal extent of proximal phalanx was seen in one horse, comminuted fractures of the proximal phalanx in three horses and incomplete sagittal fracture in two horses.

Ultrasonographic scans in five horses with no osseous radiographic abnormalities showed enlargement in both of the superficial and deep digital flexor tendon with decreased echogenicity. One horse had an echoic core lesion of the deep digital flexor tendon (Fig. 1). Two horses have hyperechogenicity and adhesions between the SDFT and the DDFT associated with increased echogenicity of the digital annular ligaments (Fig. 2). Distension of the digital flexor tendon sheath with hypoechoic dots were seen in one horse with septic tenosynovitis. Chronic medial/lateral

suspensory ligament branches desmitis with considerable fibrosis between the branch and skin were identified in three horses (Fig. 3). Suspensory ligament branches desmitis was identified in sesamoiditis and apical fractures of the proximal sesamoid bones. Horses suffered from sesamoiditis displayed concurrent ultrasonograhic changes in both the suspensory ligament branches and the digital flexor tendons. The suspensory ligaments branches appeared tearing with irregular borders of less echogenicity (Fig. 4) and dystrophic calcified zone was also detected. The suspensory ligament branches imaging in sesamoid bones with apical fractures showed hyperechogenicity with enlargement along with fibrous adhesions between the medial or lateral branches and the surrounding tissues. Chronic digital flexor tendons tendonitis, digital synovial sheaths thickening and digital annular ligament desmitis were the consistent findings ultrasonographically associated with increased in structural echogenicity with suspensory apparatus abnormalities in draught horses in the present studies.

Ultrasonographic findings of the distal sesamoidean ligaments showed fetlock osteoarthritis with dorsal fetlock joint recess enlargement with presence of hypoechoic area indicating the synovial fluid. The medial oblique distal sesamoidean ligaments had hypoechoic core lesion in horses with proximal phalanx fractures (Fig. 5). The straight distal sesamoidean ligament appeared with hypoechogenicity with marked adhesions which appeared as hyperechoic interface between it and the superficial and deep digital flexor tendons (Fig. 6). Irregularity of the surface bone echo of the proximal phalanx with adhesions between the SDFT, the DDFT and the straight distal sesamoidean ligaments was observed on chronic distal sesamoidean ligament desmitis in one horse (Fig. 7).

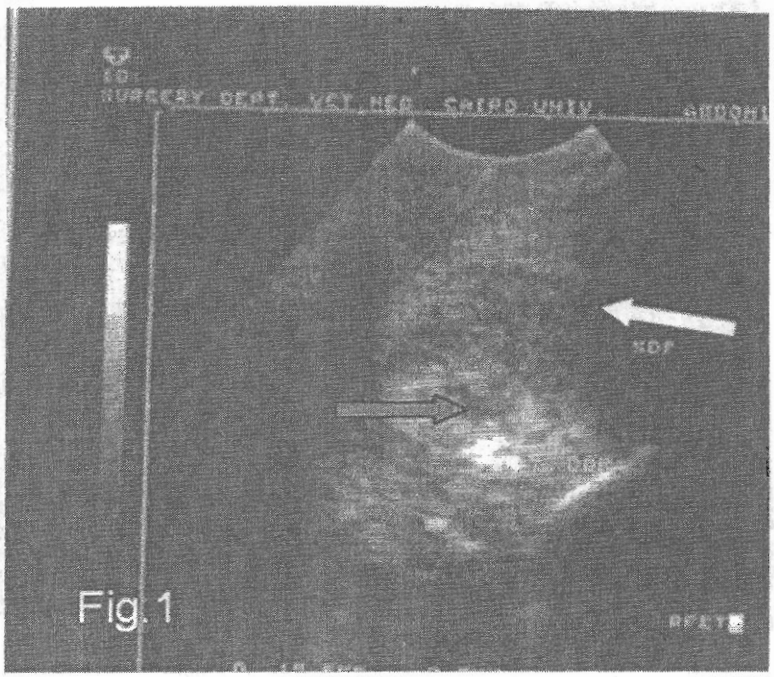

Fig.1: Transverse scan at the palmar aspect of fetlock in a 5 year-old more affected with chronic flexor tendon tendonitis showing: severe enlargement of the SDFT with decreased in echogenicity (white arrow) and enlarged DDFT with core lesion (blue arrow).

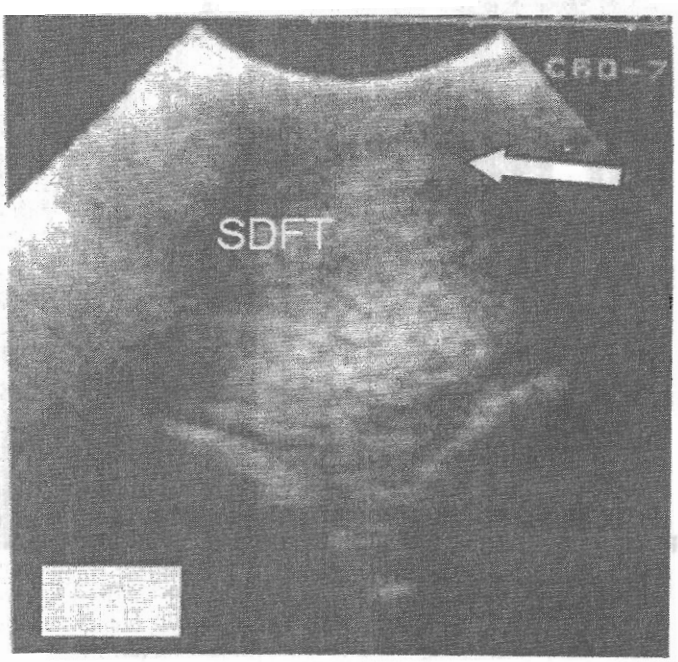

Fig.2: Transverse scan of left fore limb fetlock in a 4 year-old more with chronic flexor tendons tendonitis and suspensory ligament desmitis showing enlarged, hyperechogenicity and adhesions of the SDFT & DDFT and increased echogenicity of the palmar digital annular ligament (arrow).

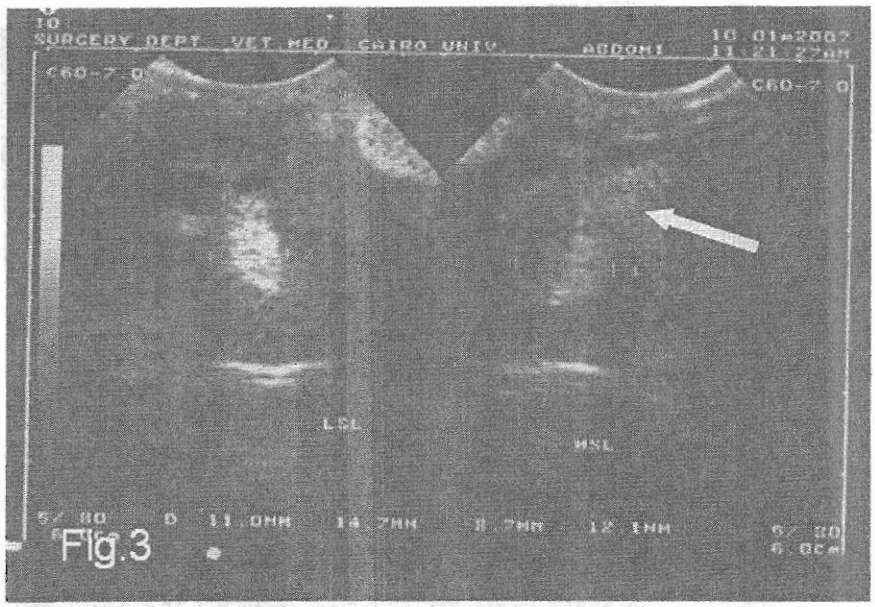

Fig.3: Transverse scan of the right fore fetlock in a 10 year-old horse with sesamoiditis showing medial suspensory ligament branch desmitis with fibrosis between the branch and the skin (arrow), in comparison with the lateral suspensory ligament branch (left).

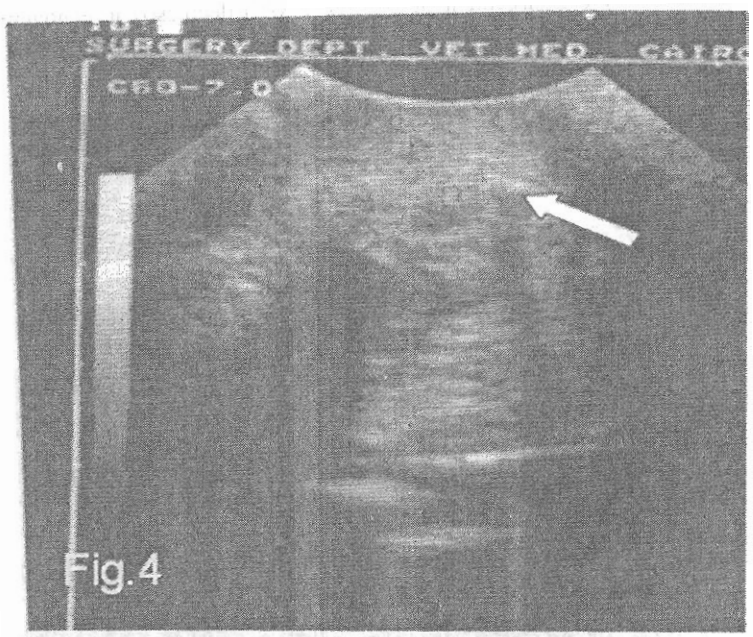

Fig.4: Transverse scan of lateral suspensory ligament desmitis of a 9 year-old horse with palmar hard fetlock swelling, Notice calcification of lateral suspensory ligament branch and highly echogenic interface from acoustic shadowing (arrow).

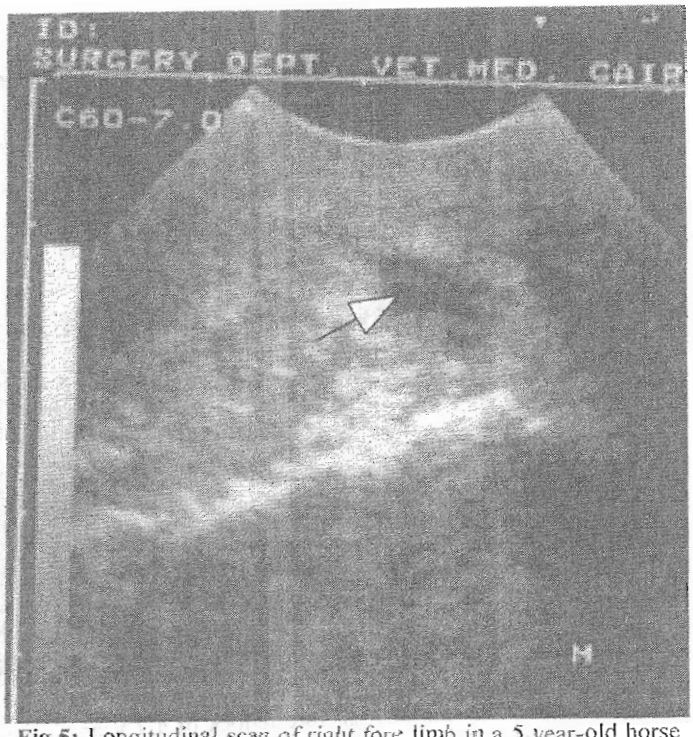

Fig.5: Longitudinal scan of right fore limb in a 5 year-old horse with comminuted fracture of PI showing: hypoechoic core lesion within the medial oblique distal sesamoidean ligament (arrow).

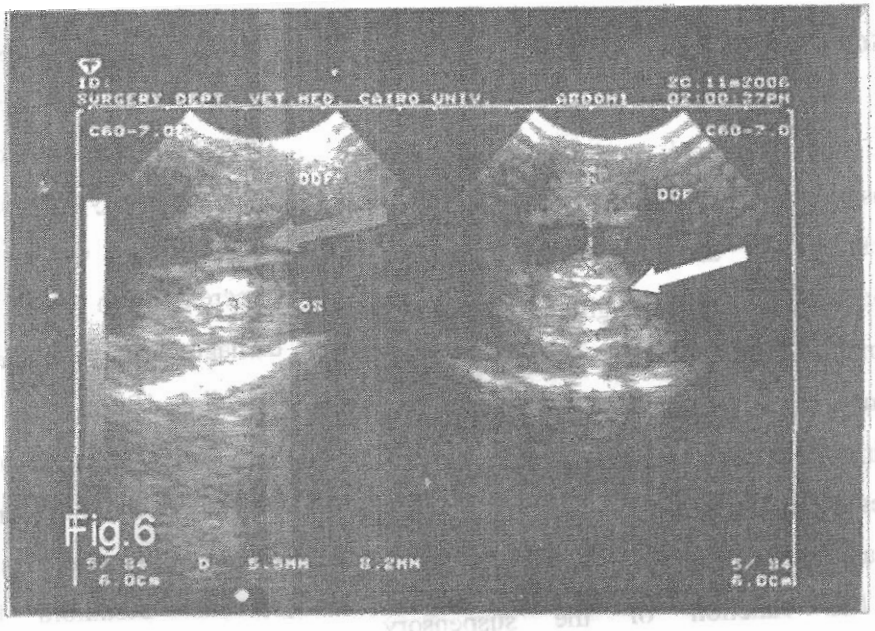

Fig.6: Transverse and longitudinal scan in a 9 year-old horse with chronic desmitis of the distal sesamoidean ligament showing: hypoechoic masses within anechoic digital flexor tendon sheath (blue arrow), hyper echoic calcification within straight distal sesamoidean ligament with anechoic zone surrounded it (white arrow).

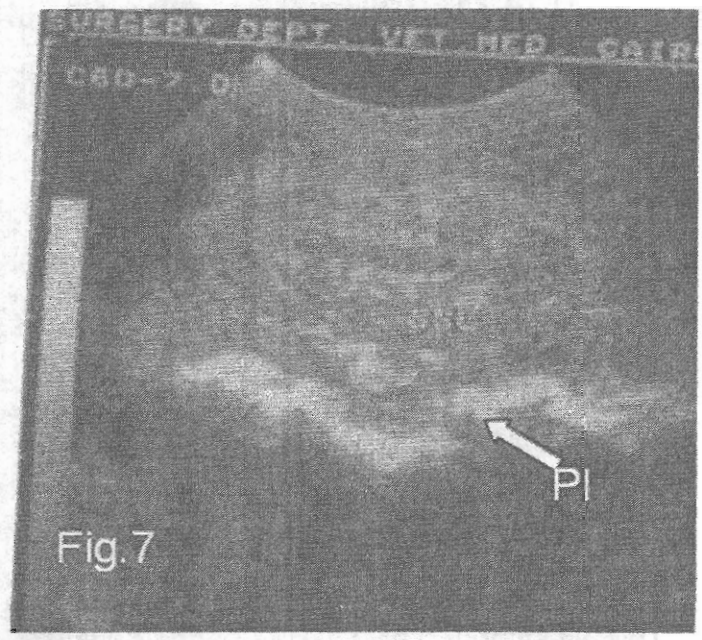

Fig.7: Transverse scan of right fore fetlock of a 7 year-old horse with chronic distal sesamoidean ligaments desmitis of both fore limbs showing: irregularity of the bone (arrow) of the first phalanx (PI), marked adhesions between the SDFT, the DDFT and the straight distal sesamoidean ligament and appeared hypoechoic.

DISCUSSION

The clinical, radiographic and ultrasonographic studies of the hard and soft structures of the suspensory apparatus abnormalities in draught horses had sesamoiditis and fractures of the proximal sesamoid bones in addition to fractures of the proximal phalanx (PI) were the common hard tissues contributed to damaged suspensory apparatus structures.

The function of the suspensory apparatus is to resist extension of the fetlock joint. During the stance phase, the extension of the fetlock joint induces high strains in the suspensory ligament (SL), proximal sesamoid bones, the distal sesamoidean ligaments (DSL) as well as the superficial digital and deep digital flexor tendons (Dyson 1996).

Supraphysiological strains in all these structures during extension and hyperextension might induce injuries and damaged in any one of these structures (Redding, 1996).

Early diagnosis of suspensory apparatus was based on both clinical and radiographic changes at the dorsal aspect of the base of the proximal sesamoid bones and or the proliferative changes along the palmar/planter aspect of the proximal phalanx (Moyer and Raker, 1980). Little attention has been given to the Ultrasonographic disorders of the

suspensory apparatus in draught horses. Desmitis of both lateral and medial branches of the suspensory ligaments and distal sesamoidean ligaments in addition to chronic digital flexor tendon tendonitis were observed in all cases of suspensory apparatus injuries. Desmitis of the medial/lateral branch of suspensory ligament were the relatively common injuries occurring in both fore and hind limbs in the draught horses examined. Peri ligamentous fibrosis or echo dense material between the branch and the skin and associated dystrophic hyperechoic lesion were identified. (Genovese et al., (1986); Dyson et al., 1995) reported in addition to these changes, distension and enlargement of the digital flexor tendon sheath were identified. Dyson (1996) concluded that horses with fibrosis between the suspensory branch and the skin and dystrophic mineralization showed persistent lameness and poor prognosis

Moreover, these findings were associated with chronic inflammation and chronic recovery desmitis (Dyson, 1996; Reef, 1998). Therefore, continuous pathological changes and lameness were observed in these animals.

The suspensory ligament changes seen occurred concurrently with the changes in the bones and other structures. O'Brien et al. (1971) found macroscopically chronic tearing of either the suspensory ligament or the distal sesamoidean ligament during proximal sesamoid bone lameness in standard breeds horses. Consequently, the suspensory ligament branches appeared ultrasonographically tear, irregular, less echogenic and dystrophic calcified zone were detected in sesamoiditis and apical fractures of the proximal sesamoid bones. Meanwhile, chronic suspensory ligament branches desmitis were observed in 6 horses without osseous radiographic changes, this might be attributed to overextension of the fetlock joint during carrying heavy load moreover, over use of these animals leading to suspensory ligament injuries in draught horses.

On contrary to these findings in the present study, race horses were found more predisposed to fracture of the proximal sesamoid bones than to tearing of suspensory ligament (Gabel, 1990).

It is interesting that, injury to the deep digital flexor tendon was found concurrent with the superficial digital flexor tendon in draught horses. In contrary, injuries to the deep digital flexor tendons are rare (Barr et al. 1995) Meanwhile, injuries of the superficial flexor tendons and suspensory ligaments are relatively common (Redding, 1996).The deep digital flexor tendons appeared thickened, hyperechogenicity and had central core lesions. The increased echogenicity were related to gradual tendon fibres reorientation (Silver et al. 1983) as well as to healing of injured tendons (Reef, 1998). Injuries of the

suspensory apparatus in the present study were commonly complicated in both hard and soft tissues and may have accounted to overuse of these animals on heavy load and lack of hoof care.

The distal sesamoidean ligaments represented the digital component of the suspensory apparatus, the proximal sesamoid bones and palmar ligament being intercalated between the suspensory and the distal sesamoidean ligaments (Dyson et al. 1995). Injuries to the straight distal sesamoidean ligaments are rare (Dyson, 1996). However, injuries to the oblique distal sesamoidean ligaments being more commonly due to unilateral asymmetric loading (Redding, 1996). Injuries in the present study reported here were commonly detected during proximal phalanx fractures in draught horses. Desmitis of the distal sesamoidean ligaments were often associated with enthesiophytes formation at the origin and insertion of the proximal phalanx. Such abnormalities were often detected radiographically and ultrasonographically. The proximal phalanx showed irregularity in the contour with marked adhesions between the superficial and deep digital flexor tendons. (Denoix et al., 1997) explained the bone irregularity to enthesiophytes formation.

In conclusion, the suspensory apparatus structures in the fetlock region have complicated multiple structures disorders. Major abnormal ultrasound findings presented in this study were a combination of bones, tendons and ligaments injuries. Sesamoiditis, fractures of the proximal sesamoid bones and the proximal phalanx were associated with more ultrasound structural disorders. Chronic desmitis of the suspensory ligaments with fibrosis, calcification, tearing and increased in echogenicity were seen. Concurrent Chronic digital flexor tendon tendonitis with increased in thickness, and hyperechoic fibrous masses were encountered in most of cases. Desmitis of the SDSL and ODSLs were detected in cases of traumatic suspensory apparatus disruption, and proximal phalanx fractures. Therefore, ultrasound examination was required to obtain definitive diagnosis and prognosis in horses with fetlock swelling and lameness.

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إستخدام الموجات فوق صوتية لدراسة الجهاز المعلق لمفصل الرمانة فى خيل الجر

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تمت دراسة راديولوجية وفوق صوتية على الجهاز المعلق لمفصل الرمانة فى عدد ٢٥ حصان جر.

وقد أظهرت الدراسة الراديولوجية وجود إلتهاب فى العظام السمسمانية وكسور بها وكذلك كسر فى عظام السلامية الاولى وبدراسة الموجات فوق صوتية أظهرت الدراسة وجود إلتهاب فى الرباط المعلق وزيادة فى سمك وحجم الرباط مع وجود تمزق وتهتك فى الأنسجة المكونة له مع وجود تكلسات عليه.

كما أوضحت الدراسة وجود إلتهاب فى الأربطة السمسماتية السفلى (الأربطة المستقيمة والمائلة) مصاحب معها وجود إلتهاب مزمن فى مفصل الرمانة وكذلك إلتهاب فى الوتر السطحى والعميق القابض حول مفصل الرمانة وقد تبين من هذه الدراسة أن إستخدام الموجات فوق الصوتية وجود تغيرات كثيرة ومعقدة فى تركيب الجهاز المعلق لمفصل الرمانة مما يؤثر على كفاءة الحيوان بعد العلاج.