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Musculoskeletal injuries in the horse: the uses and limits of diagnostic ultrasonography

Sue Dyson

Equine Centre, Animal Health Trust, Newmarket, UK

Summary

Diagnostic ultrasonography has been widely used for assessment of injuries of the superficial digital flexor tendon but has many other uses in lameness diagnosis. This paper summarises some of those uses and the limitations of diagnostic ultrasonography. Diagnoses which are readily made radiographically are excluded.

Keywords: ultrasonography, horse, injuries, tendons, muscles, joints

Muskuloskeletale Verletzungen bei Pferden: Die Möglichkeiten und Grenzen der Ultraschall-Diagnostik

Die Ultraschall-Diagnostik wird meist bei der Beurteilung von Verletzungen der oberflächlichen Beugesehne genutzt, jedoch gibt es daneben in der Lahmheitsdiagnostik viele andere Einsatzmöglichkeiten. In dieser Veröffentlichung werden einige dieser Einsatzmöglichkeiten sowie die Grenzen der Ultraschall-Diagnostik aufgezeigt. Diejenigen Diagnosen, die leicht röntgenologisch gestellt werden können, sind hier ausgenommen.

Schlüsselwörter: Ultraschall, Pferd, Verletzungen, Sehnen, Muskulatur, Gelenke

Tendonitis and desmitis

(See also "Swelling in the pastern region" and "Swelling in the proximal metatarsal region".)

Superficial digital flexor tendonitis

Ultrasonography can be used to detect lesions of the superficial digital flexor tendon (SDFT) associated with subtle and/or transient clinical signs, to differentiate between subcutaneous oedema and enlargement of the SDFT per se, to assess the severity of lesions associated with more obvious clinical signs, to aid in determining the most appropriate method of treatment and to monitor healing. In some, but by no means all, cases some estimation of the age of the lesion can be made. It may not be possible to determine whether an injury is acute or a sequel to a previous injury. An accurate prognosis usually requires serial re-examinations. Ultrasonography gives no indication of the strength of a healing tendon. Normal echogenicity may never be restored although the tendon may be strong enough to withstand work.

Desmitis of the accessory ligament of the SDFT (the superior check ligament)

Desmitis of the accessory ligament of the SDFT is usually associated with lameness and swelling on the caudal distal radius. Ultrasonography is invaluable in determining the cause of the soft tissue swelling.

Suspensory ligament desmitis

Injuries of the suspensory ligament (SL) may involve the proximal one-third, the body or one or both branches. Since the proximal one-third of the SL is inaccessible to palpation, ultrasonography is essential for identifying abnormalities. For more distal lesions ultrasonography is as useful as for SDF tendonitis (see above).

Desmitis of the accessory ligament of the deep digital flexor tendon

Desmitis of the accessory ligament of the deep digital flexor tendon (ALDDFT) or inferior check ligaments is usually associated with obvious localised swelling and lameness. Ultrasonography is useful for determining the extent of the lesion, identifying any concurrent lesions in the deep digital flexor tendon or the SDFT, and rarely the SL, and for monitoring healing.

Deep digital flexor tendonitis

Tendonitis of the deep digital flexor tendon (DDFT) is comparatively unusual. Focal lesions in the fetlock region within the digital flexor tendon sheath (DFTS) are usually associated with tenosynovitis. These lesions can only be detected ultrasonographically. More diffuse lesions in the pastern occur occasionally. Unfortunately imaging the DDFT within the foot is currently impractical.

Gastrocnemius tendonitis

Gastrocnemius tendonitis is usually associated with moderate to severe lameness. There is often associated distension of the calcaneal and gastrocnemius bursae and a capped hock appearance. Ultrasonography is essential for diagnosis of the lesion, and is useful for monitoring healing.

Enlargement of a tendon sheath

Distension of a digital flexor tendon sheath

Ultrasonography can be used to assess:

(i) thickness of the sheath wall
(ii) partial rupture of the sheath wall
(iii) fibrosis around the sheath
(iv) adhesions traversing the sheath
(v) mineralisation within the sheath
(vi) associated thickening of the palmar or plantar annular ligament
(vii) associated flexor tendon pathology

Septic tenosynovitis

There is distension of the sheath wall with abnormal amounts of synovial fluid. Very small particulate matter may be seen floating in the fluid. If the condition is chronic there may be thickening of the sheath wall and adhesion formation. Diagnosis is confirmed by synovial fluid analysis.

Bursitis of the intertubercular (bicipital) bursa

Aseptic or septic bursitis of the intertubercular bursa is characterised by an abnormal amount of synovial fluid, with or without particulate matter. In chronic cases adhesions and/or mineralised fragments may be identified. The tendon of biceps brachii may be enlarged, with or without hypoechoic lesions. There may be associated roughening of the humeral tubercles.

Distension of the carpal sheath

Distension of the carpal sheath may be idiopathic, or seen in conjunction with tendonitis of the SDFT, or more rarely the DDFT, or desmitis of the ALDDFT. It may be secondary to a solitary osteochondroma. Ultrasonography may be used to assess:

(i) thickness of the sheath wall
(ii) adhesions
(iii) associated flexor tendon pathology

The SDFT and DDFT contain muscular tissue at this level and accurate identification of lesions is sometimes difficult.

Investigation of soft tissue swelling on the dorsal aspect of the carpus

Ultrasonography is used to see whether swelling is restricted to tenosynovitis or concurrent tendon pathology (e.g. rupture of the extensor carpi radialis tendon), or is associated with an hygroma. Contrast radiography is more useful to identify a synoviocoele or communication between two adjacent tendon sheaths.

Distension of the tarsal sheath (thoroughpin)

Ultrasonography can be used to assess:

(i) thickness of the sheath wall
(ii) adhesions
(iii) mineralisation within the sheath
(iv) associated flexor tendon pathology

and to differentiate between a true thoroughpin and an acquired bursa.

Differentiation of soft tissue swellings

Diffuse soft tissue swelling in the metacarpal/metatarsal region

Ultrasonography may be used to help identify the cause of swelling:

(i) oedema
(ii) haemorrhage
(iii) suspensory desmitis
(iv) desmitis of the accessory ligament of the deep digital flexor tendon
(v) superficial digital flexor tendonitis
(vi) deep digital flexor tendonitis (rare in the author's experience except as a sequel to infection or direct trauma).
(vii) cellulitis
(viii) infection of the SDFT or DDFT
(ix) haematoma
(x) rupture of a ligament or tendon.

Swelling in the pastern region

Ultrasonography may be used to identify the cause of swelling:

(i) tendonitis of the medial and lateral branches of the superficial digital flexor tendon
(ii) deep digital flexor tendonitis
(iii) desmitis of one of the distal sesamoidean ligaments
(iv) subcutaneous fibrosis
(v) abscess
(vi tenosynovitis of the DFTS
(vii) digital annular ligament enlargement

Infection

Identification of an abscess

Ultrasonography can be used to identify an abscess which often has a thick relatively hyperechoic fibrous capsule and an echolucent cavity or multiple echolucent cavities.

Identification of a foreign body

A foreign body per se can only be identified if it is echogenic, e.g. glass. If non-echogenic its presence will stimulate the accumulation of pus which is anechoic.

Osteomyelitis

Ultrasonography can be more sensitive than radiography for early diagnosis of osteomyelitis, associated with a draining tract. The draining tract (an echolucent tract) may be followed to a bone surface. An accumulation of anechoic fluid adjacent to the bone surface is indicative of osteomyelitis. Sequestrum formation may also be identified.

Joint injuries

Chronic proliferative synovitis (villonodular synovitis)

Chronic proliferative synovitis is associated with swelling on the dorsal aspect of the fetlock. If the synovial proliferation is readily palpable then it is easily visualised ultrasonographically and contrast radiography is not required. The author has had insufficient experience to indicate how small a lesion could be identified.

Collateral ligament desmitis

With experience the collateral ligaments of the elbow, fetlock, pastern, stifle and hock may be visualised ultrasonographically. Tears or avulsions may be detected. Concurrent avulsion of a bony fragment may also be identified.

Other ligaments

Injuries of the patellar ligaments are readily identified ultrasonographically. Although it is possible to image limited parts of the cruciate ligaments and the meniscal cartilages, diagnostic arthroscopy is currently thought to provide much more accurate information concerning injuries to these structures and also the meniscal ligaments. It is not possible to assess the palmar intercarpal ligaments. Ultrasonography can be used in some locations to assess cartilage thickness but the clinical usefulness of this is yet to be determined.

Identification of fractures

Ultrasonography can be useful for identification of fractures in regions which are not readily examined radiographically in a standing horse. Stress fractures of the ilial wing are a prime example and are visualised as a discontinuity of the normally smooth outline of the bone. Healing by callus formation can also be monitored. Small avulsion fractures at the origin of the suspensory ligament on the third metacarpal or metatarsal bone may be more easily detected ultrasonographically than radiographically.

Disorders of muscle

The superficial muscles of the horse can be easily evaluated using either a 5 or 7.5 MHz transducer. Ultrasonography can be used to identify:

(i) Haematoma or oedema
(ii) Muscle fibre tearing
(iii) Fibrosis and/or mineralisation.

However lesions may be restricted to an extremely localised area, therefore may be missed unless accompanying clinical signs direct the examiner to evaluate carefully that specific area.

Aortoiliac thrombosis

The aorta is readily visualised using a rectal probe as a wide-bore anechoic tube through which small particulate matter can be seen to flow. Close to the termination of the aorta an echodense band is seen apparently attached to the dorsal wall of the aorta. The aorta is visualised in longitudinal section and the internal and external iliac arteries in transverse section.

Thrombosis is characterised by accumulation of echodense material within the lumen of the vessels. However lesions confined to more distal parts of the iliac arteries or in the femoral arteries are not accessible for evaluation.

Dr Sue Dyson MA VetMB PhD DEO FRCVS

Equine Centre
Animal Health Trust
PO Box 5
Newmarket
Suffolk CB8 7DW