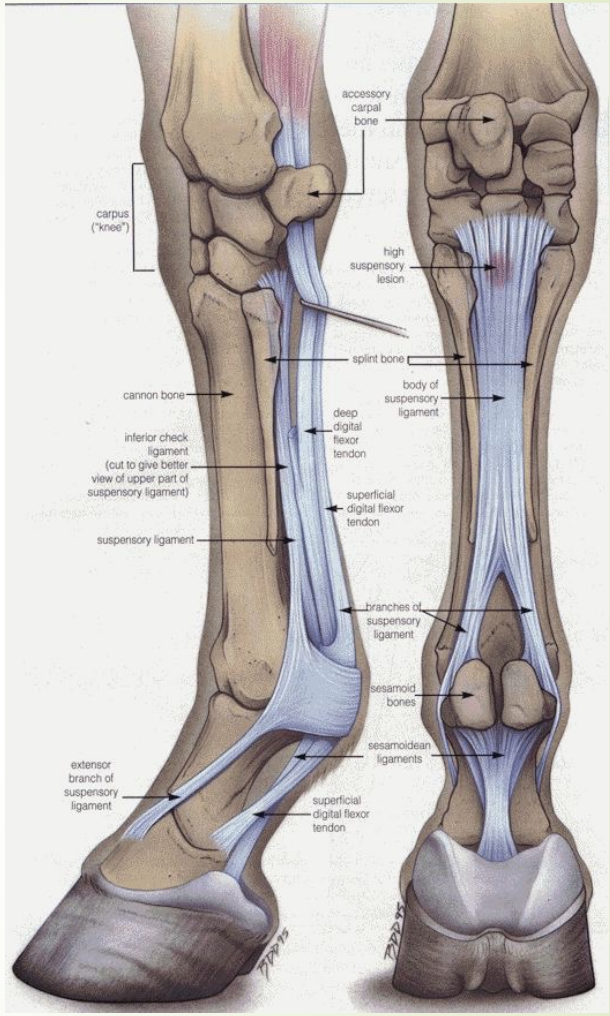
Diagnosis and management of suspensory desmitis

Senior lecturer Crecan Cristian , DVM, PhD
Department of Surgery, FMV Cluj

Functional anatomy of the suspensory ligament

- The suspensory ligament (or *musculus interosseus medius*) is the major supporter of the metacarpophalangeal (MCP) and metatarsophalangeal (MTP) joints.
- It is originates from the palmar/plantar aspect of the proximal metacarpus/metatarsus and inserts via two branches onto the abaxial surface of the proximal sesamoid bones.
- This 'suspensory apparatus' of the MCP/MTP joint continues distally as the distal ***sesamoidean ligaments***.
- The suspensory ligament is divided into three equal thirds by reason of its anatomical features and the nature of its injuries – ***proximal, body and branches.***
- This so-called ligament is derived from the muscle and, in deference to its ancestry, retains some muscle tissue within its substance.
- This is restricted to the proximal and body of the ligament and its function is unclear although it may serve to dampen high frequency impact forces (1)..



Proximal suspensory desmitis

- Proximal suspensory desmitis is a common cause of both forelimb and hindlimb lameness.
- The proximal region of the suspensory ligament in the hindlimb is contained within a more restricted canal made up of the large head of the lateral splint bone, the head of the medial splint bone and the overlying fascia.
- This anatomy has suggested that lameness related to the proximal suspensory ligament injury may arise from compression of the adjacent nerves rather than from the ligament itself, or of adjacent bony and soft tissue structures.

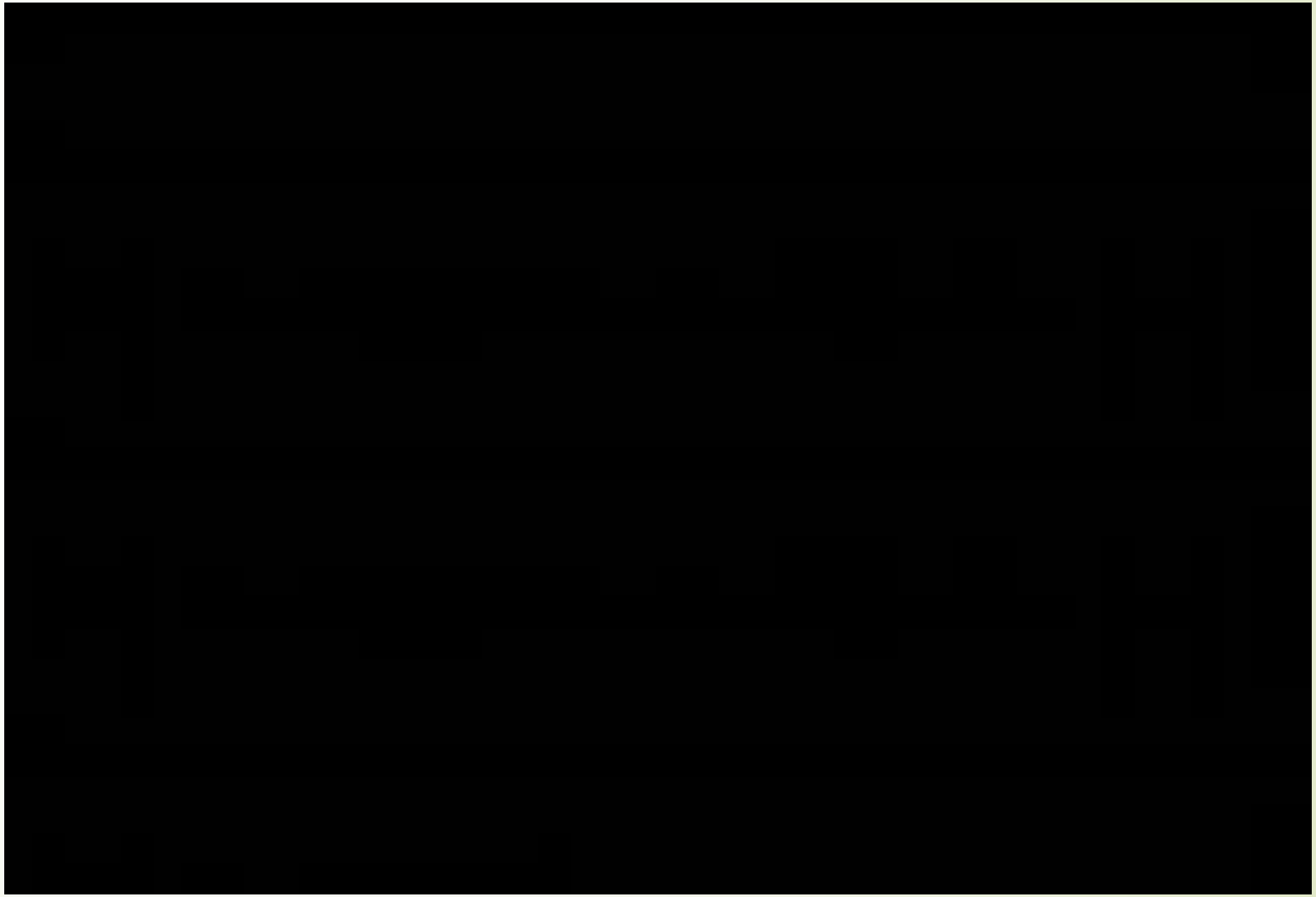
Diagnosis proximal suspensory desmitis

Conformation

- In the forelimb, minimal conformational abnormalities.
- Over-flexion metacarpophalangeal joint suggests a severe injury and is consequently a poor prognostic sign.
- In the hindlimb, it is frequently, though not always, associated with a straight hock, hyperextended MCP/MTP joint.

Nature of the lameness

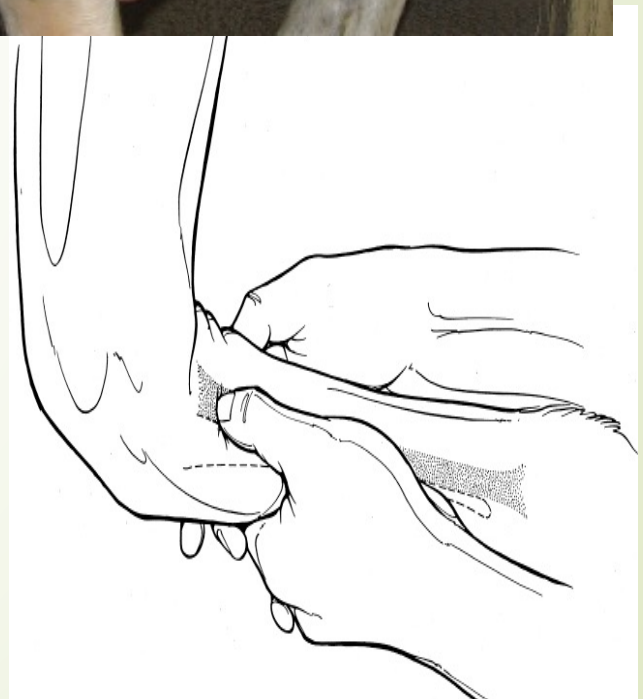
- Lameness is often (but not always) worse with the limb on the outside or a circle and on a soft surface compared to the hard.
- Bilateral lameness is common and can be mild to moderate in degree.
- Some horses will present with just **‘poor performance’,** especially with PSD of the hindlimbs.



Clinical signs

- Signs of acute inflammation – e.g. swelling, heat and pain over the affected ligament – may be evident in recent and acute cases but frequently this swelling is absent or very transient.
- Swelling and heat is best identified by palpation in the standing limb while pain on palpation is easier to detect in the raised limb.
- In the forelimb the digital flexor tendons can be moved to one side while a thumb is pressed directly against the origin of the suspensory ligament.
- It is important to compare sides because some unaffected horses will show a response to this digital pressure.
- The proximal suspensory ligament in the hindlimb is more difficult to palpate because it is largely covered by the heads of the lateral and medial splint bones and overlaid by the digital flexor tendons.
- The best technique here is to exert pressure on the proximal suspensory ligament by compressing the flexor tendons against the proximal suspensory ligament.

Clinical examination



Diagnostic analgesia

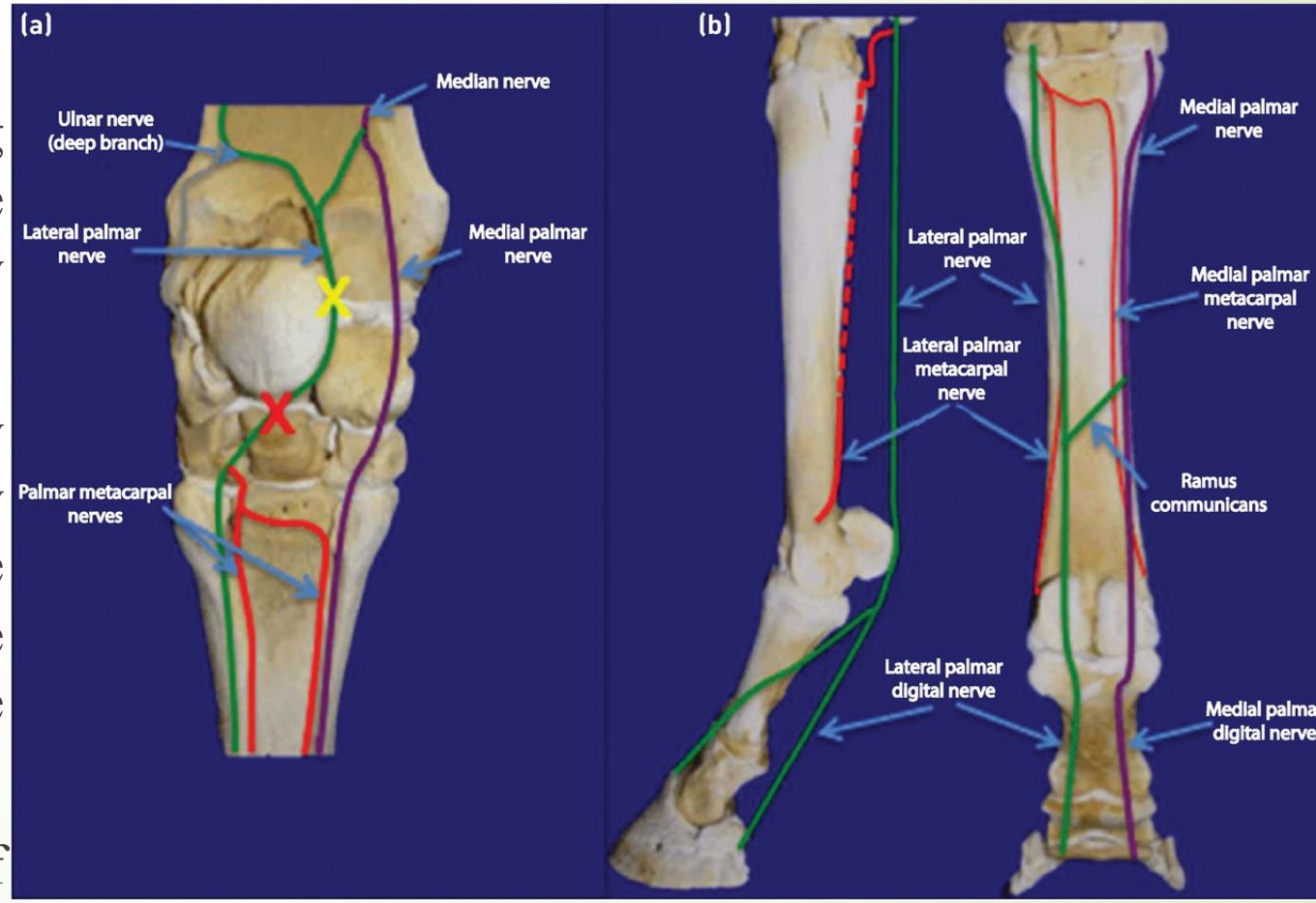
FORELIMB - There are six different ways of removing sensation from the proximal/body of the suspensory ligament.

1. High 4 Point Block:

- **Palmar Nerve**: between suspensory ligament and DDFT, underneath the heavy fascia of the flexor retinaculum (no skin bulging occurs during injection) just below the level of the carpometacarpal joint
- **Palmar Metacarpal Nerve**: between the suspensory ligament, palmar aspect of cannon bone and axial side of the splint bones, just below carpometacarpal joint.
- Test of block: superficial sensation: skin sensation on distal palmar aspect of metacarpus, or bulbs of heel (difficult if blocked previously below). Deep sensation: squeeze test on suspensory ligament.

2. ‘Subcarpal’ Block

- As for the high 4 point but without the palmar nerves.
- There is danger of inadvertently entering the distal palmar recesses of the carpometacarpal joint, thereby desensitizing carpal joint pathology.
- These recesses are also very closely opposed to the proximal suspensory ligament, such that analgesia of the carpometacarpal joint (via the middle carpal joint) can have some effect on the proximal suspensory ligament.
- Therefore requires separate analgesia of the middle carpal joint at a separate time.

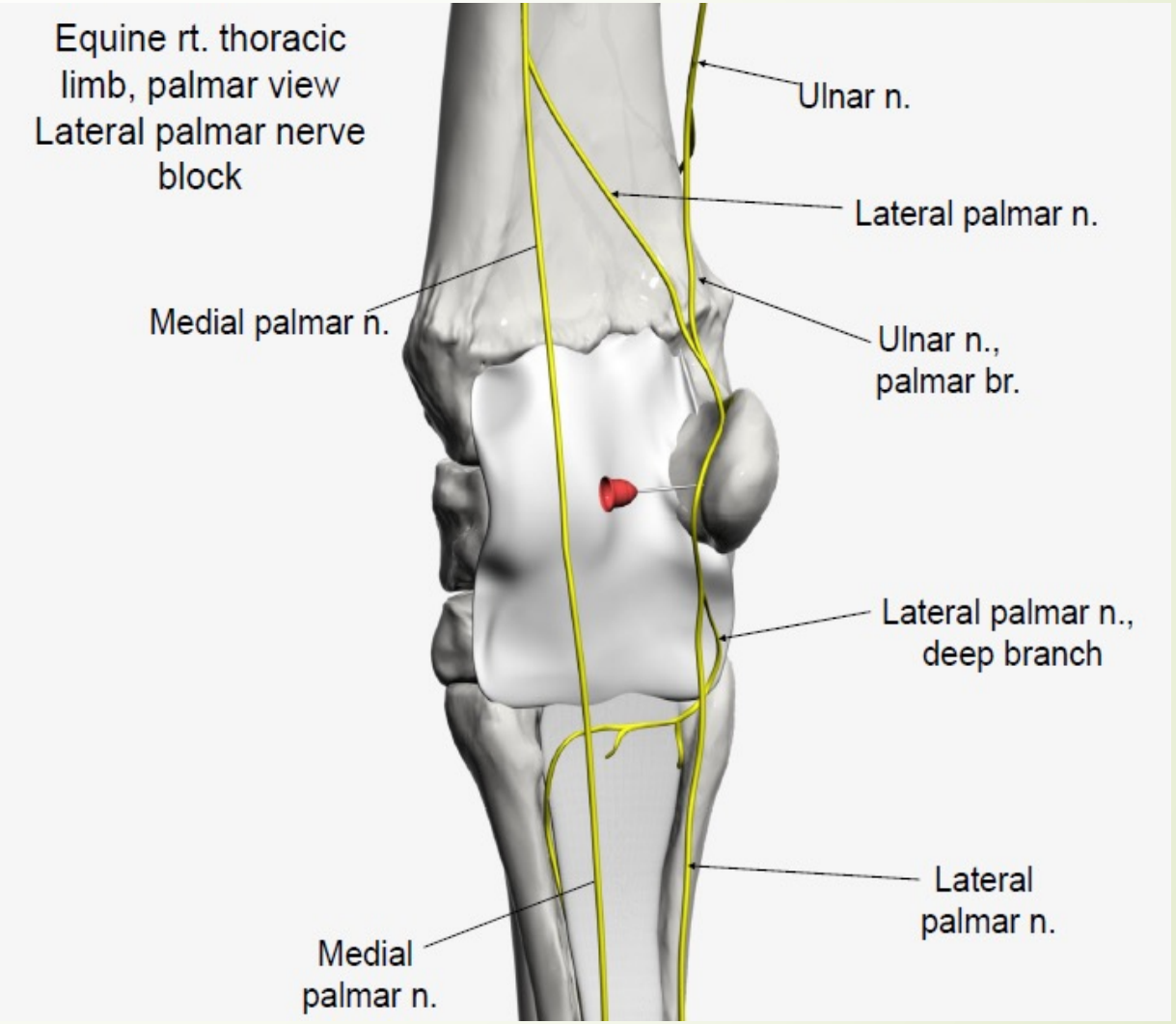


3. Lateral palmar nerve block – distal to accessory carpal bone

- Lateral palmar nerve block just below accessory carpal bone halfway down the palmar border of the ligament between the accessory carpal bone and the head of the lateral splint bone.
- The needle penetrates 2-3 mm of flexor retinaculum. 20 G - 1 inch - 5 ml, with the limb flexed.
- Carries a small risk of entering the carpal sheath.

4. Lateral palmar nerve block – palmaromedial to accessory carpal bone

- In the palmaromedial groove of the accessory carpal bone. 25 G – 5/8 inch- 2ml.
- No risk of entering the carpal sheath in one published study (2).



5. Direct infiltration

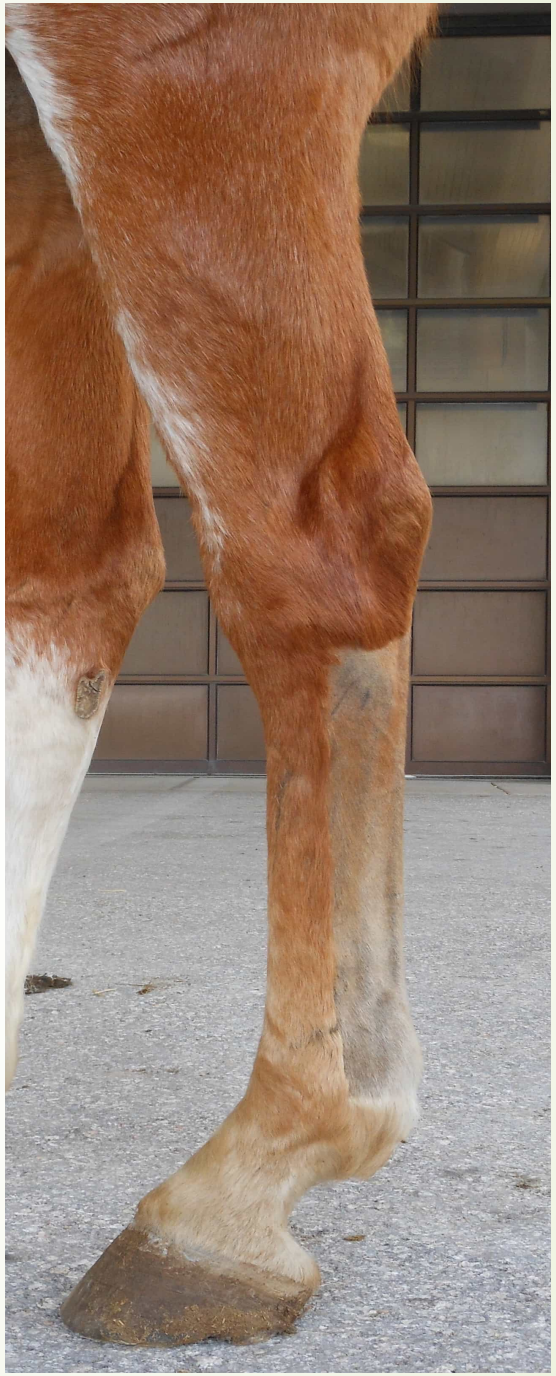
- Direct infiltration from both medially and laterally over the origin of the suspensory ligament.
- Similar to subcarpal block. (carries the same limitations).

6. Ulnar nerve block

- In the muscular groove just proximal to the accessory carpal bone. This is possible, since only fibres of the ulnar nerve contribute to the palmar deep innervation system.

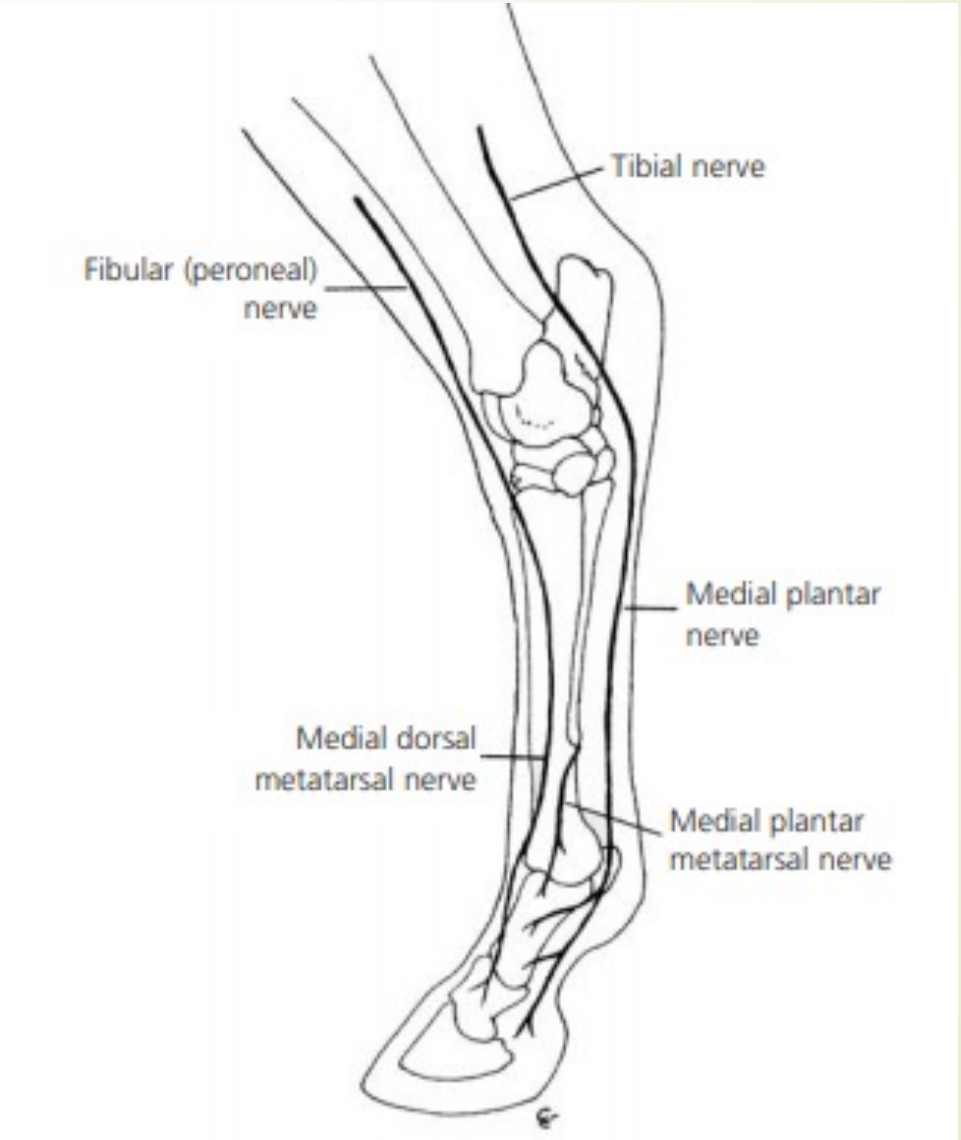
Hindlimb

- There are three different ways of removing sensation from the proximal/body of the suspensory ligament.



1. High 6 point block

- As for the forelimb but with additional local anaesthetic injections performed more dorsally to desensitise the dorsal metatarsal nerves (dorsomedial and dorsolateral aspect of metacarpus and digit at approximately 2 and 10 o'clock).

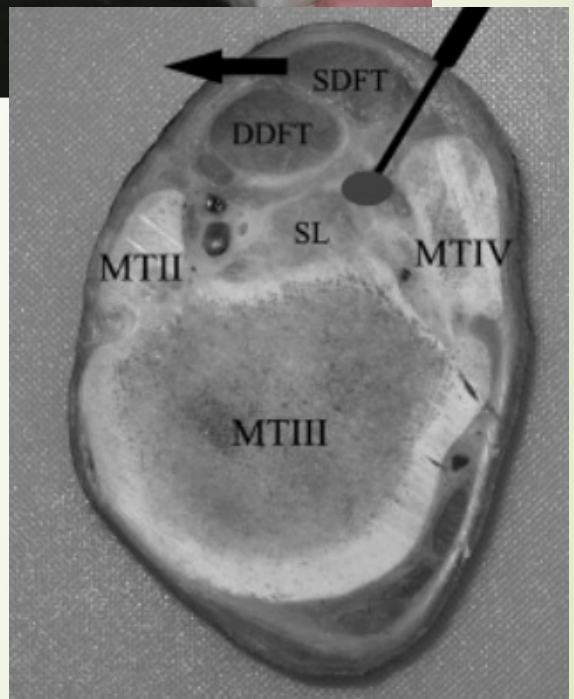


2. ‘Subtarsal’ block

- As for the forelimb but again carries the same risks of accidentally injecting local anaesthetic into the tarsometatarsal joint.

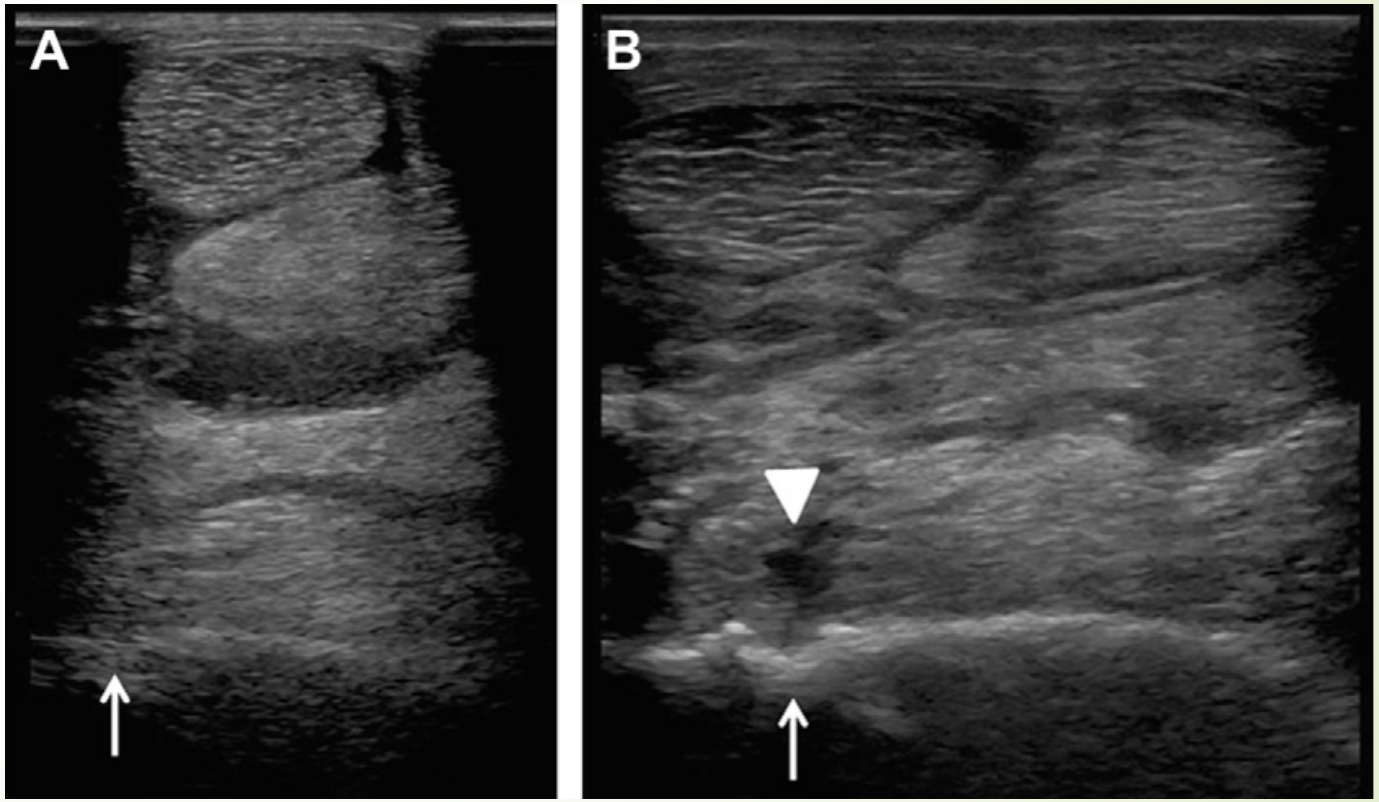
3. Deep branch of the lateral plantar nerve block (DBLPN):

- This block has generally replaced the subtarsal block in the hindlimb as it eliminates the risk of entering the tarsometatarsal joint (although with a small risk of entering the tarsal sheath).
- The nerve lies against the plantar surface of the SL, close to the axial surface of the lateral splint bone. It is performed 1.5 cm below the proximal margin of the lateral splint bone, with the limb lifted, between the lateral margin of the SDFT and the plantar border of the lateral splint bone. 1 inch – 20 to 22 G – 2-4 ml of local.
- This block is reasonably specific for lameness arising from pain of the proximal part of the suspensory ligament, although diffusion can influence small tarsal joint pain on occasion. While the DBLPN is specific for the proximal suspensory ligament region, the location of the injection is close to the lateral palmar nerve itself, thereby potentially affecting the lateral plantar nerve and desensitizing the majority of the distal limb. Therefore, prior negative low 6-point diagnostic analgesia is essential to ensure an accurate diagnosis.



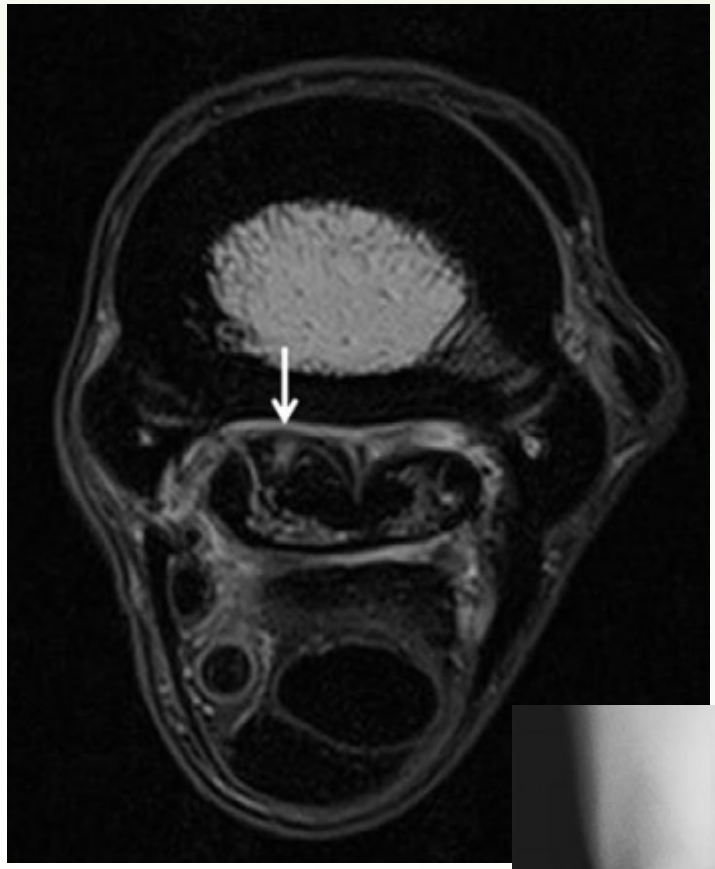
Ultrasonographic examination of the proximal suspensory ligament

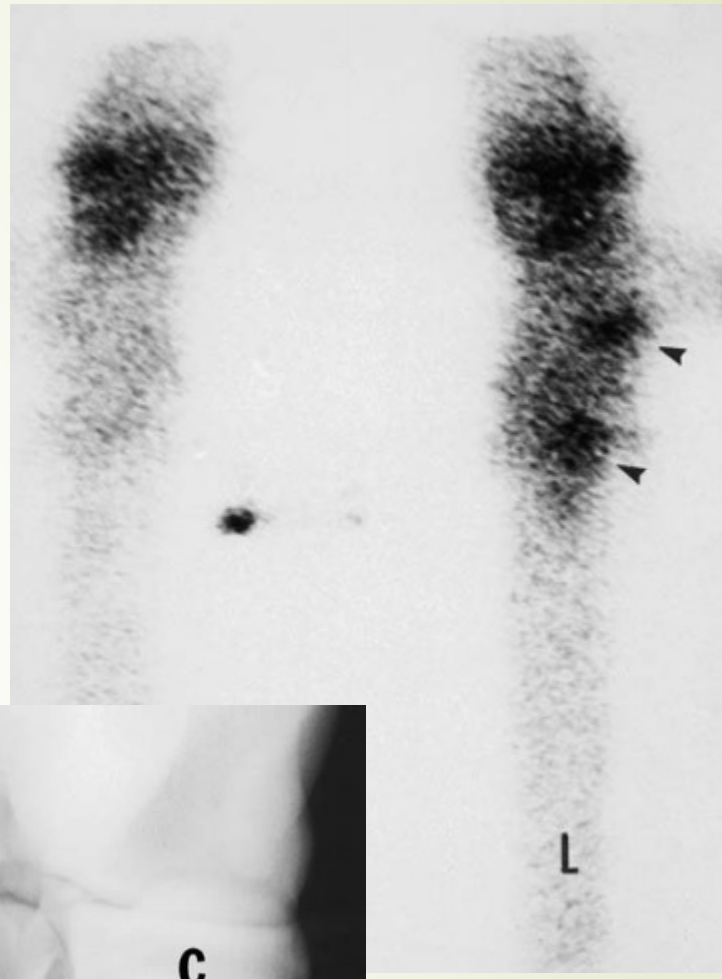
- The proximal suspensory ligament can be imaged ultrasonographically using a 7.5MHz or above linear-array transducer from the palmar aspect of the limb in a similar fashion to the flexor tendons.
- The ligament is visualised deep to the accessory ligament of the deep digital flexor tendon in the forelimb and deep to the small subtarsal accessory ligament and the flexor tendons in the hindlimb, has a more heterogeneous echogenicity than the flexor tendons, and a less linear striated pattern on longitudinal views.

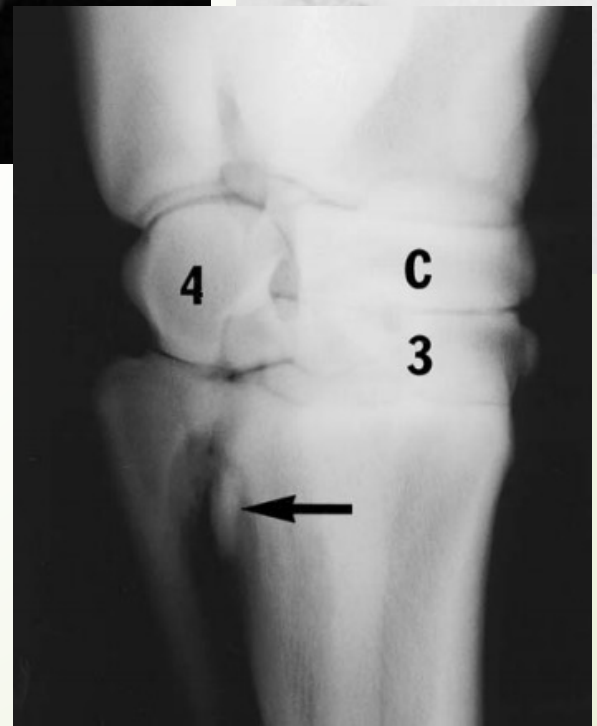


Other imaging modalities

- Radiography should be performed routinely to identify bony pathology.
- Gamma scintigraphy has a releativly low success in identifying proximal suspensory desmitis but uptake in the region of the origin of the suspensory ligament, especially in the hindlimb, can be identified. It can also be used to identify avulsion fractures and adjacent splint bone pathology.
- MRI has been used to identify pathology in the proximal suspensory area when other imaging modalities have been negative and this appears to have better sensitivity and specificity (3).







Treatment

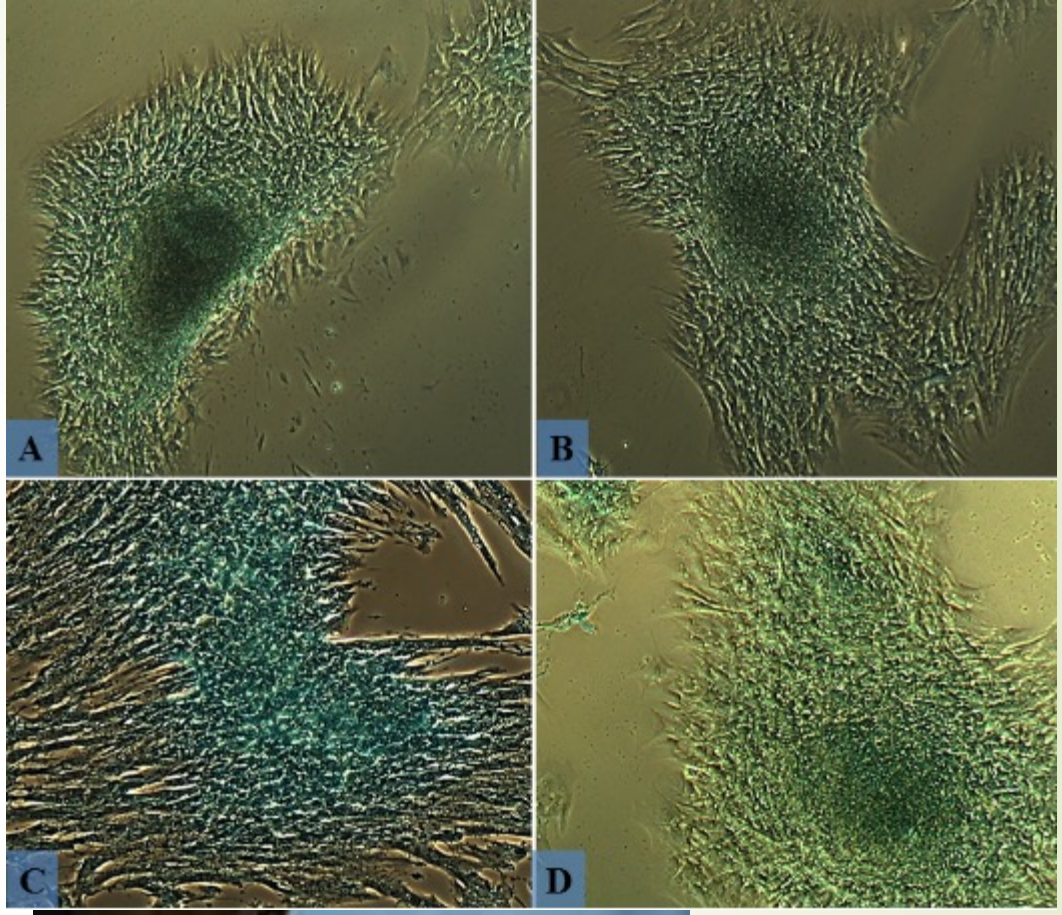
Conservative treatment

- **Box-rest** with walking exercise for, in the first instance ***3 months*** which can be extended for ***up to 6 months*** in hindlimb cases if improvement is seen, followed by an ascending exercise regime.
- **Extracorporeal shock wave therapy** which has shown significant improvements in prognosis in chronic hindlimb cases (4).
- **Periligamentar** injection of **corticosteroids** can be very helpful in acute stages to minimise the effect of suspensory ligament swelling on pressure of adjacent nerves but this can also adversely affect ligament healing (if damage is evident).

Treatment

Intra-lesional injections of mesenchymal stem cells or platelet-rich plasma have been recommended although there is concern that these injections in the absence of a fasciotomy can increase the risk of a compressive neuropathy which is thought to be involved in the aetiopathogenesis of many hindlimb proximal suspensory desmitides.

No significant comparative case series has been published to determine which of these intralesional treatments is the most effective.



Treatment

Equine Vet J. 2012 May;44(3):361-7. doi: 10.1111/j.2042-3306.2011.00445.x. Epub 2011 Aug 23.

Management of hindlimb proximal suspensory desmopathy by neurectomy of the deep branch of the lateral plantar nerve and plantar fasciotomy: 155 horses (2003-2008).

Dyson S[1], Murray R.

⊕ Author information

Neurectomy and fasciotomy has been proposed for hindlimb cases (5).

Care should be made in selecting the appropriate cases – horses with hyperextending fetlocks do not do as well and horses with ultrasonographically apparent marked disruption to the proximal suspensory ligament are less appropriate because of the risk of subsequent exacerbation or rupture.

Prognosis

- There are stark differences in the prognosis for fore and hindlimb proximal suspensory desmitis.
- Acute forelimb proximal suspensory ligament desmitis carries a good prognosis with ~90% returning to full work following conservative management (6, 7).
- The figures for chronic (with lameness of more than 3 months duration) forelimb proximal suspensory desmitis are more uncertain. For the hindlimb equivalent, the prognosis for acute desmitis is much worse (13% sound and in full work at 6 months;(6)), with the prognosis for chronic hindlimb cases approaching 0%.
- Shockwave has been shown to return 43% of chronic hindlimb cases to full work after 6 months (4) ***while fasciotomy and neurectomy has been reported to have a higher success rate of 79%*** (5)

Desmitis of the body and branches of the suspensory ligament

Isolated lesions of the body of the suspensory ligament - are more common in racehorses than in sports horses.

Where pathology of the body of the suspensory ligament usually arises from proximal extension of branch injuries.

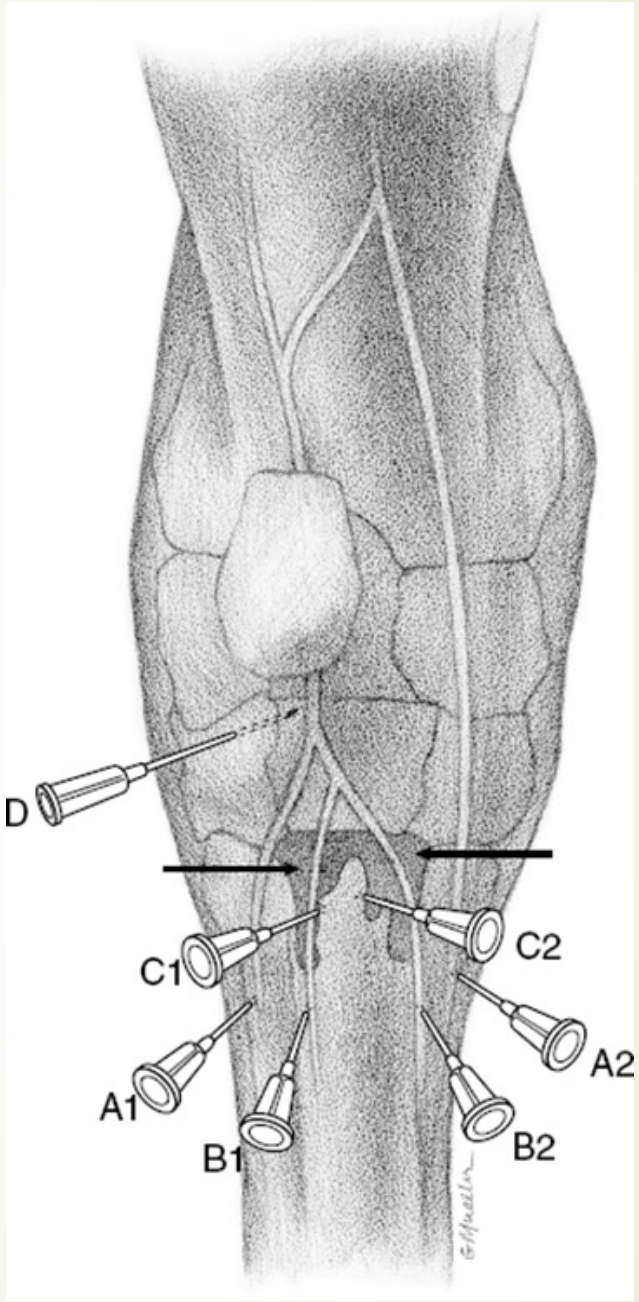
Diagnosis

- Diagnosis is usually not difficult for the body, branch and the proximal suspensory in the forelimb because injury is associated with palpable abnormalities, pain and swelling of the affected area.
- Lameness may be worse with the limb on the inside or outside of a circle depending on the branch affected and also can be worse on hard surfaces compared to soft.
- Collapse of the MCP/MTP joint when weight-bearing indicates loss of support from the suspensory ligament and represents a poor prognostic sign while lameness not associated with a loss of support will give rise to reduced extension of the MCP/MTP joint because of the reduced weight-bearing load.

Diagnostic analgesia

- ***Palmar/plantar nerves*** (subcutaneously between the suspensory ligament and digital flexor tendons at the level of the proximal limit of the digital sheath)
- ***Palmar metacarpal/plantar metatarsal nerves*** (immediately below the button of the splint bone) on either side of the limb (or uniaxially for each branch).

23-25 G – 5/8 inch - 2ml.



Ultrasonography examination of the body and branches of the suspensory ligament

- The body of the suspensory using a 7.5MHz or above linear-array transducer from the palmar aspect of the limb.
- The dorsal border of the ligament is usually distinct and separated from the underlying palmar aspect of the metacarpus.
- Consequently, the branches must be imaged from the lateral and medial aspects using transverse and longitudinal images.
- As with lesions in other areas of the suspensory ligament, acute branch/body desmitis has a very variable ultrasonographic appearance, from focal ‘core’ lesions to generalised enlargement and hypoechogenicity.

Other imaging modalities

- Radiographic evaluation of the proximal sesamoid bones, splint bones and MCP/MTP joint is advised to identify concurrent bony pathology.
- This includes enthesious new bone and/or abaxial avulsion fractures on the abaxial surface of the proximal sesamoid bones where the suspensory ligament branch inserts, proximal sesamoid bone fractures, distal fractures of the splint bones, and dorsoproximal proximal phalanx chip fractures in the MCP/MTP joint associated with, as a cause or consequence (through loss of palmar/plantar joint support), over-extension of the joint.
- While articular fractures would require arthroscopic removal, the distal splint fractures rarely require removal.

Treatment

- **Conservative treatment** of tendon strains applies also to these injuries
- Anti-inflammatory management in the acute stages (e.g. rest, application of cold, bandaging).
- Controlled ascending exercise with careful ultrasound monitoring in the reparative and remodelling phases.
- ***Unlike with tendon injuries where the lesions usually resolve, albeit with fibrosis, persistence of ultrasonographic demonstrable abnormalities is not uncommon in the suspensory ligament.***
- Hence, a certain amount of guesswork may be required to decide when to return the horse to full work.
- This is usually based on the convalescent time (6-12 months depending on severity) and clinical signs.

Ligament splitting/debridement to remove necrotic material (9) for abaxial lesions can be considered and splitting has been suggested for recalcitrant lesions although no evidence for efficacy has been published.

As for proximal suspensory desmitis, the use of mesenchymal stem cells and/or growth factors (e.g. that supplied by platelet-rich plasma (PRP)) may provide other alternatives. Of these, PRP appears to be currently the most popular supported by an experimental study (10) and with some limited uncontrolled case series showing apparent benefit (11, 12).

It is important to know if any branch lesions extend into the adjacent joint cavity, especially when contemplating intralesional treatment. If such lesions are suspected, arthroscopic evaluation and debridement is indicated.

Good foot balance

- Egg-bar shoes, or shoes with branches extending caudally behind the heels, especially in hindlimbs, have been recommended to be protective of the suspensory ligament and therefore considered important adjunctive therapies.
- A shoe with a wider contact area at the toe has also been recommended to help reduce MCP joint extension through sinking of the heels into soft ground and tensing of the DDFT as a secondary supporter of the MCP joint. This shoe is probably most appropriate for forelimb cases although it should be used with caution because of the potential to increase loading on the DDFT and navicular apparatus.

Prognosis

- Definitive predictions of prognosis are not available in the literature.
- *However, suspensory desmitis has a high recurrence rate and frequently contra-axial and contralateral branch injuries occur after the original branch injury has healed, reflecting the preceding degenerative nature of injury to this structure.*
- Current estimates are 40-50% for a successful return to athleticism.

Suspensory ligament desmitis and splint bone fractures and exostoses (‘splints’)

- Frequently the presence of ‘splints’ are blamed for causing focal suspensory ligament desmitis. In this author’s opinion, this is an overstated risk. While, large, or axial, exostoses can interfere with the suspensory ligament, most do not. However, when the ‘splint’ is the consequence of a previous comminuted splint bone fracture, bone fragments can be pushed into the suspensory ligament which subsequently causes severe damage to the ligament. These cases should be carefully evaluated ultrasonographically using oblique views as the borders of the suspensory ligament can be difficult to evaluate ultrasonographically. Often a palmarolaterally positioned probe is best to evaluate the medial border and a palmaromedial probe position for the lateral border in such cases because of the shadowing created by the exostosis/callus. Non-weight bearing views can also be helpful as this enables the axial margin of the splint bone, adjacent to the suspensory ligament and hence likely to be involved in any impingement, to be evaluated. Where new bone is found to be interfering with the suspensory ligament, surgical removal is recommended.

Generalised suspensory desmitis

All regions of the suspensory ligament can be damaged in catastrophic strain injuries. The MCP/MTP joint is hyperextended because of the loss of support to this joint. Radiographically the proximal sesamoid bones become displaced distally. The prognosis for these injuries are guarded for a return to high level exercise, but casting of the limb to reverse the hyperextension of the MCP/MTP joint and allow the ligament to heal without recurrent tearing through weight-bearing can produce surprisingly good results. A jointed support boot may also offer some prospect for MCP/MTP joint support during exercise (13). More complete breakdown of the suspensory apparatus requires MCP/MTP joint arthrodesis for salvage.

Distal sesamoidean ligament desmitis

- Either the straight or oblique distal sesamoidean ligaments (DSLs) can be injured through over-strain. Distal flexion tests are usually very positive and pain can be elicited in acute cases by digital pressure applied abaxially deep to the deep digital flexor tendon (for the oblique DSLs) or through the deep digital flexor tendon (for the straight DSL). These injuries usually respond to abaxial perineural analgesia and frequently with digital sheath intra-thecal analgesia.
- The presence of pathology can be confirmed by ultrasound although this requires careful examination as diagnostic images are difficult to produce (especially for the oblique DSLs) and frequently contain off-incidence artefacts. Periligamentar fibrosis can be a confirmatory sign although other imaging modalities, such as MRI, can provide improved sensitivity and specificity. It is not unusual for lesions to extend into the digital sheath (giving rise to a digital sheath tenosynovitis).
- Treatment is as described for suspensory ligament branches. Lesions that communicate with the digital sheath can benefit from **tenoscopic debridement** and a number have been treated with **intralesional mesenchymal stem cells**.

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