The suspensory ligament (SL) in the horse is similar in forelimbs and hind limbs. For the purpose of these proceedings, the forelimbs will be addressed and separate mention of the hind limbs will be made if significant differences exist. The SL can be divided into essentially three distinct regions which are each subject to injury. The proximal region (PSL), the body and the suspensory ligament branches (SLBr).

The SL arises from the proximo-palmar aspect of the third metacarpus (MC3) and continues distally between the second and fourth metacarpal bones to give rise to a lateral and medial branch at the level of the distal one third of MC3. The branches insert onto the abaxial border of their respective proximal sesamoid bones before continuing dorsally to coalesce with the common (forelimb) or long (hind limb) digital extensor tendon. Distal sesamoidean ligaments exist as a functional continuation of the SL and originate from the base of the proximal sesamoid bones. Straight, oblique, cruciate and short sesamoidean ligaments are present. The principle function of the SL is to prevent excessive extension of the fetlock joint. Injuries of the suspensory ligament are not uncommon and can occur in any of the three regions previously mentioned. In the forelimb, the SL is innervated by the deep branch of the lateral palmar nerve which itself arises from branches of the median and ulnar nerves. In the hind limb, the SL is innervated by the deep branch of the lateral plantar nerve (DBrLPIN) which arises from the tibial nerve.

Proximal suspensory ligament desmitis

The proximal aspect of the suspensory ligament is a compartment bound structure with MC3 dorsally, the second and fourth metacarpal bones abaxially and the deep palmar fascia between the suspensory ligament and the deep digital flexor tendon. Inflammation or desmitis of the PSL is a well-recognized cause of lameness affecting horses used for many disciplines including, but not limited to, show jumping, dressage and racehorses. The condition has also been described as proximal suspensory ligament desmopathy (PSLD) and is a progressive degenerative condition resulting from excessive strain exceeding the strength of the proximal suspensory ligament and repetitive work trauma. Because the PSL is a compartment bound structure, the lameness associated with PSLD has been attributed to local compartmental syndrome resulting in compression of the nerve by which it is innervated. The condition can involve the ligament itself in the form of fiber disruption, or a core lesion may be present where there is focal loss of normal fibers. In more severe cases, injury to the proximo-palmar aspect of cannon bone can occur in the form of fractures and enthesiophyte formation.

Clinical signs of PSLD include mild to moderate sudden onset lameness that can be quite transient with some horses appearing to be sound within 24hrs. Bilateral conditions are not uncommon and can result in a change in gait making the horse appear to have a stilted action rather than unilateral lameness. A consistent finding in the author’s experience is pain upon deep palpation of the PSL between the heads of the splint bones when the limb is lifted off the ground and the carpus partially flexed. The diagnosis of PSLD is confirmed by a
significant improvement in lameness following perineural analgesia of the deep branch of the lateral palmar or plantar nerve. It is important to note the close proximity of these nerves to the carpo-metacarpal joint pouch in the forelimb and the tarso-metatarsal joint pouch in the hind limb. If intra-articular analgesia of these joints is positive, then consideration must be given to the potential for PSLD or even a fracture of the proximal cannon bone. Ultrasonography, radiography and magnetic resonance imaging (MRI) are commonly employed to visualise changes in the ligament and palmar cortex of MC3/MT3. MRI is noted to be more sensitive for detection of osseous pathology associated with desmitis and adhesion formation.

A period of rest following injury has been reported to have a poor success rate where a return to a horse’s previous level of training and performance was considered a positive outcome. Other studies evaluating rest in combination with either radial or focal shockwave therapy have reported success rates of 14-58%.

Surgical intervention includes desmoplasty, neurectomy and fasciotomy of the deep palmar/plantar metacarpal/tarsal fascia or a combination of the two latter techniques. Success rates after surgical intervention have been reported as ranging from 62-91% in returning horses to their previous level of competition. A recent study at the HKJC revealed that in hind limbs, deep plantar metatarsal fasciotomy to relieve compartment pressure in the PSL generated subtle iatrogenic trauma to the underlying PSL. This trauma was most obvious at the level of the distal third of the fasciotomy incision and was less severe in limbs where a Y-shaped fasciotome was used as opposed to Metzenbaum scissors. Fasciotomy incisions using a Y-shaped fasciotome were significantly longer than incisions using Metzenbaum scissors, suggesting the potential for greater release of compartmental pressure. In another HKJC study, the authors identified a reduction in the cross-sectional area and lateral to medial width of the PSL following plantar metatarsal fasciotomy and neurectomy of the DBrLPIN. In many equine competitions, regulatory bodies have banned the surgical act of neurectomy. Owners’ expectations and the use of the horse must be taken into careful consideration before surgical intervention.

**Body of the suspensory ligament**

Injuries of the SL body are not uncommon and frequently result in swelling and pain upon palpation. In the authors experience, in racehorses in training there can be a period of adaptation whereby the SL body may feel warm and the horse is reactive upon palpation although trots sound and has no obvious ultrasonographic abnormalities. These horses tend to respond well to 10-14 days of reduced exercise (no galloping), ice and a short course of low-dose NSAID therapy.

The diagnosis of an injury to the body of the SL is usually readily made using ultrasonography. A linear probe is used to gain cross-sectional and longitudinal images of the SL along the length of the cannon bone at consistent levels. The size of the SL can be measured using cross-sectional area and/or latero-medial width and dorso-palmar/plantar thickness which should be compared to the contralateral limb.

There is a plethora of data relating to regenerative medicine primarily in the form of intra-lesional administration of stem cells and platelet-rich plasma (PRP). Some data is encouraging (particularly in sport horses) although the optimal, gold standard intra-lesional therapy is yet to be established. The treatment of tendon and SL core lesions using intra-lesional PRP is commonly elected for by owners in Hong Kong. It is a relatively safe
procedure that can be performed expeditiously thanks to several different commercially available kits. Current evidence suggests that PRP preparations with platelet concentrations two- to fourfold over what’s found in blood and low numbers of leukocytes are optimal for increased tissue repair.

**Suspensory branch injuries**

Desmitis of the lateral or medial SLBr is relatively common in athletic horses. Usually only a single branch is affected and in TB racehorses, forelimbs are more commonly injured with the medial branch being overrepresented. Clinical signs depend upon the severity of the injury and how long it has been present although localized heat, swelling and pain upon palpation are consistent findings. Fetlock effusion may also be present, especially if damage of the insertion of the SLBr onto the abaxial border of the proximal sesamoid bone exists. Lameness varies proportionally with the degree of the injury and in horses with low-grade injuries or in those with chronic lesions, lameness may be absent. Careful palpation of the affected branch and contralateral branch is essential in assessing how acute an injury may be. Assessing reaction in the contralateral limb is also valuable.

Ultrasonography and radiography are most commonly used to assess the integrity of the SLBr and to identify lesions extending proximally into the body of the SL. Radiographs are obtained if involvement of the abaxial margin of the proximal sesamoid bone is suspected. Steep, down angled oblique projections should be obtained to assess fractures of the sesamoid bones that require arthroscopic removal to identify the articular component of the fracture.

The treatment of SLBr injuries depends upon the severity of the lesion and whether there is sesamoid involvement. Initially, ice, bandaging and parenteral administration of NSAIDs is indicated for the first 5-7 days. The foot should be evaluated for balance and trimmed accordingly to reduce strain within the affected SLBr. It is important to note that ultrasonographic abnormalities often persist even once lesions have healed which can make the decision to increase workload a difficult one. In my experience, Thoroughbred racehorses with mild injuries resulting in disruption of fibres can resume light work within 2-3 months. The presence of more severe fibre damage or core lesion can indicate a moderate injury. These horses frequently require 4-6 months of rest and rehabilitation before commencing fast exercise. Extensive lesions that involve the body as well as the branch, and those that have abaxial or apical sesamoid fractures requiring surgery typically require 6-9 months of rest and rehabilitation. Saltwater spas, underwater treadmills and other therapies such as therapeutic class 4 lasers and shockwave therapy can be employed adjunctively in an effort to promote healing. Swimming and underwater treadmill exercise reduces the body weight of the horse by increasing buoyancy and thereby reducing strain on the affected ligament during the healing process. Serial ultrasound examinations are performed every 6-8 weeks or earlier if clinical signs dictate. The prognosis for the reoccurrence of SLBr injuries is seemingly quite high in athletic horses and regular monitoring is essential to identify early signs of re-injury. Failure of the suspensory apparatus in TB racehorses is catastrophic and clinical signs of suspensory ligament injury during training warrant prompt investigation.
Notes