A Review and Update on Tendon and Ligament Injuries

As a horse propels himself toward a jump, he shifts his weight backward, gathers his hind end, and with a smooth propulsive motion extends his hind limbs, releasing amassed energy that launches his half-ton body into the air. He curls his fore and hind limbs toward his body, then transitions into landing by protracting his shock-absorbing forelimbs.

This athletic move—among others—is a massive coordinated feat, straining the hind tendons during launch and the forelimb tendons and associated ligaments at landing. It’s no wonder tendon and ligament injuries comprise up to 46% of sport horse injuries, says Nick Huggons, DVM, Dipl. ACVS, surgeon and co-owner of San Luis Rey Equine Hospital, in Bonsall, California.

In this article we’ll discuss three common types of tendon and ligament injuries and how veterinarians treat them.

Superficial Digital Flexor Tendon Injury
Tendons are bands of dense connective tissue tying muscle to bone or cartilage. These structures are designed to passively transfer force across joints or provide movement. The horse’s digital flexor tendons have evolved to store energy, absorb shock, and support weight-bearing joints.

In the forelimb the superficial digital flexor tendon (SDFT) originates from the humerus just above the elbow, and in the hind limb from the back of the femur above the stifle. The tendon inserts on the first phalanx (long pastern) and second phalanx (short pastern) in each limb. It provides elastic energy storage for efficient locomotion, flexes the digit and carpus (knee), extends the hock, acts as a shock absorber, and supports the fetlock joints. The SDFT also plays a role in the forelimb’s passive stay apparatus (the mechanism that transfers the horse’s weight, usually supported by tiring muscles, to nontiring tendons and ligaments to allow horses to sleep standing) and the hind limb’s reciprocal apparatus (that maintains simultaneous hock and stifle flexion/extension, allowing horses to expend less effort when standing).

Researchers have reported SDFT injuries as the most common type of tendon/ligament injury. In one study of British racehorses and National Hunt horses, SDFT injuries accounted for up to 90% of tendon/ligament injuries. While clinicians frequently attribute the high prevalence of these injuries in racing and steeplechasing to repetitive high speed cycles and genetic predisposition, in this study the researchers found that SDFT injury can occur in lightly used horses older than 15 years of age. They also noticed an association with firm footing, older age at a horse’s first race, previous injury, and summer racing.

A veterinarian can confirm SDFT injury after gathering a history, conducting a physical and lameness examination, and performing diagnostic ultrasound. Clinical signs seen on a physical exam include lameness, heat, sensitivity to the touch, tendon swelling or thickening, and the appearance of a bowed or convex profile. The degree of lameness correlates with the severity of inflammation at the time of injury, rather than the severity of the lesion.

“If left untreated, damage to a tendon can continue to increase in severity due to the inflammatory process,” says Alfredo Romero, DVM, Dipl. ACVS, co-owner and surgeon at Syracuse Equine Veterinary Specialists PLLC, in New York. “As a result, lameness may actually resolve within one to two weeks of injury despite significant damage to the tendon and result in catastrophic injury if the horse is returned to work.” In other words, as inflammation subsides on its own, the horse can appear sound but then further damages the tendon when he starts working again.

Thus, a veterinarian’s best chance to make a definitive diagnosis is seven to 10 days following the injury. This allows time for inflammation to subside and for the lesion(s) to become visible on ultrasound. Because this imaging modality allows the veterinarian to assess an injury’s chronicity and size, performing repeated exams during the rehab period can help guide rehabilitation and treatment protocols. Ultrasound is also the most sensitive indicator of impending reinjury from an overly aggressive exercise regimen.

Huggons cites the use of newer imaging modalities, including “cross-sectional imaging techniques such as magnetic resonance imaging and computed tomography with angiography,” but he notes these advancements still have their limitations. Ongoing research involves determining if biomarkers, which are chemical indicator of injury and disease, can help reveal tissue response to training, severity of injury and stage of healing, prognosis, and the best course of treatment, he says.

Deep Digital Flexor Tendon Injury
The deep digital flexor tendon (DDFT) arises from three locations in the upper forelimb: the humerus, radius, and ulna. It then courses down the carpal canal (the depression running down the back of the knee) and crosses over the navicular bone before inserting at the back of the coffin bone, lying deep beneath the SDFT and just over the suspensory ligament. In the hind limb the DDFT originates from two areas of the tibia and also inserts on the coffin bone. This tendon plays a role in knee and forefoot flexion, forelimb elbow joint extension, and hock and hind foot flexion and extension.

DDFT injuries occur most frequently within the hoof capsule and the sheath around the tendon, likely from repetitive excessive loading. Usually, lesions appear in the body or borders of the tendon at the fetlock joint level and are more common in the hind than forelimbs. The four most common DDFT lesions are tendon enlargements or changes in shape, focal core lesions, mineralizations, and marginal tears. While veterinarians can diagnose the first three using ultrasound, they typically must use MRI (either standing or under general anesthesia) or tenoscopy (using a fiber-optic camera to explore the tendon under general anesthesia) to diagnose tears.

Suspensory Desmitis
A ligament is a band of tough connective tissue joining two bones or cartilages. Suspensory ligaments (SL) originate from the back of the fore and hind cannon bones. The SL course between the splint bones along the back of the cannon bone and divide into two branches that insert on the sesamoid bones. From these, extensor branches cross the pastern to join the digital extensor tendon along the front of the pastern joint. The SL’s main function is to prevent the fetlock joint from overextending. Researchers have shown that appropriate training in racehorses can improve the SL’s strength.

Although the suspensory ligament can fail at any point along its length, veterinarians commonly diagnose proximal (upper) suspensory desmitis (PSD) in performance horses’ limbs. It usually causes acute onset lameness that can resolve within 24 hours unless the horse continues to work hard. Lameness is typically mild to moderate, and veterinarians often detect it in Standardbreds trotting at high speeds. Soft ground exacerbates the condition, especially when the horse exercises with the affected limb on the outside of a circle. It’s common for horses to develop compensatory PSD, so veterinarians should watch for signs such as foot imbalance and flawed conformation. Initial signs might include mild edema (fluid swelling) and heat in the cannon region, and applying manual pressure will cause a painful reflex.

Veterinarians diagnosing horses with hind-limb PSD often examine horses initially because of poor performance rather than overt lameness. Although hind-limb PSD occurs in horses of all ages and disciplines, it is especially common in high-level dressage horses. Romero notes conformational predispositions can include straight hocks and long toes/short heels.

Veterinarians use nerve blocks and ultrasonography to diagnose this injury. Prognosis for hind-limb PSD following conservative therapy alone is poor, with only 14% of horses resuming full work without lameness for more than a year. Specific PSD treatment includes corrective hoof trimming and applying specialty shoes such as egg bar shoes.

Traditional Treatments
If you suspect your horse has an acute tendon or ligament injury, work with your veterinarian and start therapies such as bandaging, anti-inflammatory administration, and stall rest immediately to minimize inflammation. Rest limits loading and further injury, but occasionally veterinarians might apply splints and casts to further immobilize severe injuries that have caused fetlock joint overextension. Anti-inflammatory and analgesic (pain) drugs are essential for aiding healing: Oral or intravenous (IV) phenylbutazone (Bute) supplies a potent analgesic effect; oral, IV, or intramuscular (IM) steroids provide a strong anti-inflammatory effect; and intramuscular polysulfated glycosaminoglycan (PSGAG) offers soft tissue anti-inflammatory effects.

Physical therapy should start with 15-minute sessions of knee and fetlock joint flexions within the horse’s range of motion. Your veterinarian should then prescribe a controlled exercise regimen based on the injury’s ultrasonographic appearance. Frequent rechecks and ultrasound exams should dictate each stepwise increase in exercise level.

Popular treatment modalities such as extracorporeal shock wave therapy (ESWT) and counterirritation (using chemical blistering or thermal “pinfiring”) can be controversial. Scientists have shown no difference in collagen arrangement and scarring from pinfiring and have concluded it is not an effective tendon injury treatment. There are also conflicting views on ESWT, as researchers have demonstrated in studies that it might actually cause collagen disorganization in horses.

Originally, many veterinarians thought using ultrasound to guide injection of PSGAG or hyaluronic acid (HA) into the affected area of the tendon/ligament (and/or intralesional therapy) meant faster healing and fewer adhesions, but researchers have found little evidence of efficacy. Intralesional corticosteroids and beta-aminopropionitrile fumarate (BAPN) have also fallen out of favor due to steroid-caused mineralization and tissue necrosis, BAPN withdrawal from the market, and lack of BAPN efficacy in trials.

Certain injuries require surgical correction, which can include tendon splitting. In recent years, veterinarians have advocated this method only in acute cases involving a hematoma or seroma (fluid accumulation in the tissues that can become bone infection) because it can help decompress the core lesion. Tenoscopy is a tool veterinarians can use to debride small tears contributing to persistent lameness. Some vets perform surgical desmotomy (ligament division) of the SDFT accessory ligament to release strain, but it’s controversial because it might result in further suspensory ligament injury. Annular ligament (that which maintains tendon alignment where the tendons cross a joint) desmotomy in cases of tendon lesions within the digital flexor tendon sheath can help relieve pressure from the ligaments constricting the flexor tendon sheath at the fetlock. As a last resort for proximal suspensory desmitis, veterinarians can perform a neurectomy to transect the nerve that innervates the suspensory ligament and alleviate pain. Using this procedure, practitioners have achieved a 79% success rate in returning horses to full work without reinjury.

Advances in Treatment Modalities
Veterinarians have found some forms of complementary therapy helpful in treating tendon/ligament injuries. Therapeutic ultrasound and low-level laser therapy might improve blood flow and stimulate fibroblast (cell that helps connective tissue form) proliferation, but researchers have yet to prove the approaches’ efficacy in controlled equine trials. In humans, researchers have proven acupuncture effectively treats pain associated with tendinopathy (simply, tendon disease) in patients with chronic Achilles tendinopathy.

Biologics have emerged as the most promising tendon and ligament injury treatment. Historically, none of these modalities have been consistently superior to another for return to performance without reinjury. Part of the issue seems to be lack of spontaneous regeneration, or healing, of the tendon or ligament after injury.

Platelet-rich plasma (PRP), a blood product that contains at least twice the platelet count of normal blood, provides high levels of growth factors for healing. “In a typical healing environment, platelets are the first responders to the scene and are the first to produce a call to action from inflammatory and tissue-forming cells,” says Karen Blake, DVM, Dipl. ACVS, surgeon and owner of Elite Veterinary Services LLC, in Park City, Utah. Experimental and clinical studies focusing on the ideal PRP treatment regimen are ongoing.

Another novel treatment is scaffold-based therapy, which creates a mini-ecosystem in a wound along with growth factors and all the signals involved in the healing process.

Stem cells are undifferentiated cells in the body, which means they can give rise to many different cell types with different functions. Veterinarians can collect mesenchymal stem cells (MSCs) from adult horses and use them autologously (injected back into the source patient) to decrease the possibility of immune system rejection. As early as in 1961 researchers determined MSCs would develop into tendon cells in the laboratory, and in the 1990s scientists confirmed that the cells regenerated new tendonlike tissue in animals.

“Stem cell treatment is currently the best way to treat an overstrain injury of the superficial digital flexor tendon,” says Roger Smith, MA, VetMB, PhD, DEO, Dipl. ECVS, MRCVS, a professor at the University of London’s Royal Veterinary College, adding that treated horses have “approximately half the risk of reinjury compared to horses treated with other techniques.”

Researchers have shown that National Hunt racehorses treated with stem cell therapy had an 80% return-to-performance rate as compared to the typical 30% with conventional techniques. “MSCs appear to improve healing by increasing collagen production and improving organization of the collagen fibers, allowing the tendon to be more normal in structure at the end of the rehabilitation program,” Blake says.

Take-Home Message
We test the limits of our horses’ tendons and ligaments daily. By understanding these structures’ anatomy and functions, we equip ourselves to care for our horses better and possibly even prevent injury. If your horse does experience a tendon/ligament injury, work with your vet to identify the issue promptly and take appropriate diagnostic and treatment steps to resolve the problem and avoid reinjury.

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