Tackling Tendon and Ligament Injuries

The latest therapies for injured tendons and ligaments focus on rebuilding the tissue to its original strength and elasticity

BY KAREN BRIGGS / ANNE M. EBERHARDT PHOTOS

When it comes to tendon and ligament injuries, there's bad news, good news, and more bad news. The initial bad news, of course, is the diagnosis itself. One thing that hasn't changed in a millennia is that any injury to a horse's leg tendons or ligaments—which make possible the lifting, extending, flexing, and shock-absorbing that equine limbs do—is a serious threat to his short-term soundness and his future career prospects.

The good news is that where once the tincture of time was the only potential cure, today's veterinary medicine provides us with a dizzying array of treatment options for strained or shredded ligaments or tendons. Some can facilitate the healing process; others are tremendously promising in terms of minimizing scarring and encouraging the fibers to heal in an alignment indistinguishable from the original tissue—and that means everything in terms of restoring a horse to full soundness.

And the second round of bad news, if you can call it that, is there are so many treatment options now that it might be difficult to decide which path to choose.

Let's start by looking at some of the ways in which tendon or ligament injury can occur and then examine advances in diagnostics and some of those high-tech treatments.

Examining a horse's suspensory ligament

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When Tendons Tear and Suspensories Shred

If lameness persists past a few days, it's time to call in the advanced diagnostics

The structures most commonly injured in racehorses and performance horses are the suspensory ligament, one of which runs down the back of each cannon bone, and the superficial and deep digital flexor tendons (DDFT), which run from the back of the knee (or hock) all the way down to the navicular bone in each foot and act as a "sling" for the back of the fetlock to help it bear the animal's weight.

Either structure can be injured by sudden trauma or gradual overloading. In racehorses and elite athletes such as polo ponies and event horses, what often seems to be a single dramatic breakdown is in fact the result of weeks or months of minor strain to the tendon or ligament fibers, culminating to a point of no return.

A horse with a fresh superficial or deep digital flexor tendon injury will exhibit heat, swelling (caused by inflammation and bleeding into the interior of the structure), and lameness. Suspensory injuries can be less obvious, resulting in on-again, off-again lameness and little to no swelling. Since suspensory ligament desmitis, or inflammation, is often asso-

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ciated with splint bone problems, heat or swelling in the splint bone region might also be present.

Most horsepeople instinctively reach for ice packs and/or cold water hosing to reduce the initial inflammation when this sort of injury first occurs, and the instinct is good. But if lameness persists past a few days, it's time to call in the advanced diagnostics.

The Diagnostic Picture

When diagnosing tendon and ligament injuries, the gold standard is ultrasound, which reveals lesions and fiber disruption patterns as dark areas on the black-and-white scan. Dr. Ron Genovese was one of the first American practitioners to employ ultrasound to diagnose tendon and ligament injuries, nearly 30 years ago. The Cleveland, Ohio-based veterinarian is still considered one of the masters of ultrasound technique.

"It's a practical and useful means of diagnosing tendon and ligament injuries," he said. "It's portable and it's affordable, and the equipment has improved enormously over the years so that the images we get now are amazing. But ultrasonography is still very much a user science. It depends on the expertise of the technician operating the equipment.

"MRI (magnetic resonance imaging) is emerging as another means of studying tendon and ligament injuries, and it has some advantages over ultrasound—including being able to scan structures inside the foot—but it's far more costly, so it's usually not a client's first choice."

Dr. Katherine Garrett sees dozens of tendon and ligament injury cases at Rood & Riddle Equine Hospital in Lexington.

"Core lesions where a portion of the superficial digital flexor tendon is completely

What is Autologous Conditioned Serum (ACS)?

MediVet's Autologous Conditioned Serum (ACS) contains anti-degenerative compounds such as Interleukin-I Receptor Antagonist Protein (IL-1ra). IL-1ra blocks the inflammatory mediator Interleukin-1 from binding to its receptor and triggering an inflammatory response that leads to tissue destruction. Another important component of MediVet ACS is Interleukin 10 (IL-10). Recent study of IL-10 validates its usefulness in limiting and ultimately terminating an inflammatory response. MediVet ACS is a yellow- to amber-colored liquid derived from the blood of the animal to be treated, making the treatment completely autologous. Blood samples are shipped overnight to make the total time from collection to injection 72 hours.

What makes MediVet Lab Services process stand out?

MediVet's proprietary photoactivation technology utilizes low-level light of specific wavelengths to induce release of anti-inflammatory cytokines and inhibit pro-inflammatory cytokines from white blood cells present in whole blood samples. The anti-inflammatory cytokines induced by MediVet's Low-Level Light Therapy include IL-1ra and IL-10.

The pro-inflammatory compounds inhibited include IL-1, IL-2, IL-6 and TNF-alpha. MediVet Labs uses five different wavelengths of this cutting edge technology in vitro to modulate the pro-inflammatory and anti-inflammatory cytokine release from the white cells.

What are the indications for use of ACS?

Early arthritis, generalized joint inflammation not responding to traditional NSAID therapy, synovitis and capsulitis. A variety of soft tissue inflammation sites have been treated with ACS. In addition to direct-site usage, intravenous administration of MediVet ACS is used to increase the circulation of the important regenerative compounds in the body of the animal on a routine basis during racing and training.

disrupted are more likely to be seen in racehorses and event horses," Garrett noted. "In hunters, jumpers, and dressage horses we also see injuries of the superficial and deep digital flexor tendons within the digital sheath—and they can be more difficult to treat than injuries outside of the sheath because these injuries may heal with more adhesions."

As for suspensory ligament injuries, Garrett said her experience has taught her that the outcome depends on whether they are located in the forelimb or hind limb.

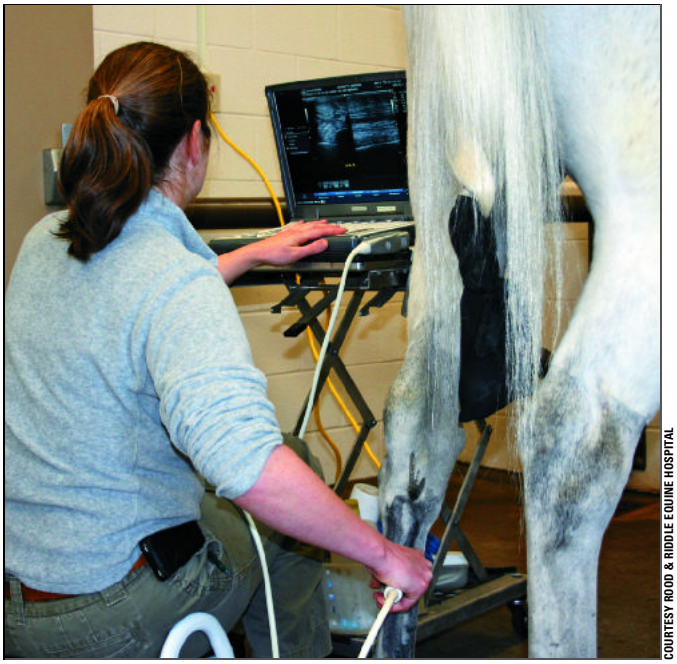
"The suspensories we see in the front legs are often just inflamed, with no actual torn fibers noticeable on ultrasound," she explained. "They respond nicely to local anti-inflammatory therapy and reduced exercise for about eight weeks.

"Hind suspensory injuries are often the result of chronic overuse and are usually seen in sport horses," she continues, noting that they can be ultrasonographically silent, necessitating MRI for effective diagnosis. "They can brew for some time, and they don't respond as well to treatment as suspensory injuries in the forelimb."

Treatment Confusion

The cornerstone of any tendon or ligament injury treatment is a controlled rest and rehabilitation program with gradually increasing exercise, according to Garrett. There are many therapies used in addition to rest and rehab, however, that can be very confusing for the horse owner.

"There are so many options, and many of them are still in their infancy, so the studies are still being done and no one really has all the answers when it comes to dosages, repetitions, or whether one is superior to another," Garrett said. "The one thing I can say



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Ultrasound is a practical and useful means of diagnosing tendon and ligament injuries

Assessing a deep digital flexor tendon

is that we've had very few adverse reactions (to these newer therapies); they seem very safe."

Following are the available options:

Platelet Rich Plasma (PRP) is a regenerative therapy that uses the horse's own platelets. A veterinarian collects blood from the injured patient and spins this blood in a centrifuge, resulting in a concentrated source of platelets that contain growth factors involved in healing. Within hours the veterinarian injects the PRP directly into the injured area.

Stem Cell Therapy Stem cells are primitive cells that can mature into different body cell types such as fat, bone, or cartilage. They are harvested from the horse's own tissue—either from his bone marrow (usually harvested from the sternum) or from adipose (fat) tissue in his rump. Typically the cells are then cultured and concentrated in the lab—a process that can take days to weeks—and injected into the injury site. There they can potentially aid healing by becoming healthy tendon or ligament cells, note veterinarians using this method.

Bone Marrow Aspirate Concentrate (BMC) is a concentrated form of bone marrow that provides both stem cells and growth factors, according to veterinarians. As with bone marrow-derived stem cells, vets harvest bone marrow from the sternum or the ilium (in the pelvis) and spin it in a centrifuge. They inject the resulting concentrated product into the tendon or ligament injury with ultrasound guidance. Unlike stem cell therapy, however, the BMC treatment can be done "in-house" and on the same day as the marrow is collected. Vets often use BMC in conjunction with PRP.

Extracorporeal Shock Wave Therapy Shock wave units emit high-pressure sound waves that are distributed in pressure surges, passing through fluid and soft tissue, and absorbed by denser structures such as ligaments and bone. By a mechanism that still isn't completely understood, these sound waves stimulate blood flow, encourage new blood vessel development, and accelerate cellular metabolism in ligaments (and to a lesser extent, tendons). This method seems to induce the greatest changes in areas where hard and soft tissues meet—for example, at "insertion sites" where tendons attach to bone.

Tendon Splitting Garrett describes this

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Using MRI to study and diagnose tendon and ligament injuries has some advantages over ultrasound, but it's far more expensive

technique: "In the first couple of days after the injury, there may be a hematoma in the core lesion. We insert a very thin tendon knife and fan it up and down a bit to relieve the pressure and inflammation. It gives the red and white blood cells and the fibrin (a protein normally found in the blood and the primary component of blood clots) accumulating there a way out, and keeps inflammation from spreading throughout the structure, and it's not all that invasive."

Plantar Fasciotomy and Neurectomy According to some veterinarians, hind suspensory injury recovery can be improved by cutting a branch of the nerve that supplies sensation to the proximal suspensory ligament and sometimes also by cutting the fascia (connective tissue) surrounding it to relieve pressure on the swollen ligament.

"The emphasis with most of these therapies is regeneration rather than repair," said Dr. Linda Dahlgren, assistant professor in the Department of Large Animal Clinical Sciences at Virginia Tech. "Repair means scar tissue, which is neither as strong nor as elastic as the original structure. We're trying to provide the ingredients for the tendon or ligament to build the right kind of matrix, so that the healed cells are indistinguishable from the original ones."

She added that combining therapies is the latest practice. "For instance, PRP supplies concentrated growth factors and signaling proteins, which are beneficial in healing," she explained. "But it also contains a protein matrix which can become a scaffold for the new cells. They adhere to the scaffold and get some instruction as to what to do. BMC and PRP together, or PRP plus stem cells, can increase your chance of good regenerated tissue."

Which therapy(s) you opt to use on your horse depends on several factors:

- The severity of the injury and how important it is to you that your horse return to his former performance level;
- your budget;
- which therapies you are able to source locally—most veterinarians will not have all of these options available, although more clinics are becoming equipped to do PRP and BMC in-house; and
- how urgently treatment needs to begin.

These treatments can aid the healing process but should not be considered to speed the process, Dahlgren cautions.

Rehab Tips

Kirsten Wertz, an eventer from Texas who successfully rehabilitated her gelding to soundness after a suspensory injury, said the most important thing to remember is to "make haste slowly."

"I believe when the veterinarians give a 'guesstimated' time for lay-up, this time needs to be doubled," she said. "When dealing with soft tissue injury, the patient should never have restricted movement such as stall rest except during the very initial healing. I believe setbacks are caused by soft tissues healing tight and stiff due to lack of movement. Keeping the horse moving allows the tissues to stretch as they heal, with less eventual risk of retearing."

Said Garrett, "We do recommend the introduction of hand-walking as soon as possible if the goal is an athletic tendon, not one that just allows the horse to be pasture sound. The fiber alignment of the tendon or ligament responds well to controlled exercise. The cross-links (between collagen molecules) within the tendon and the matrix form more normally when the tendon is functioning as it's designed to."

Rehab programs are very individual, but ultrasonographic monitoring is invariably helpful. "You can assess the degree of reduction in the lesion and how well the healing fibers are aligning," Genovese said. "Depending on what you see, you can make changes in the treatment or exercise recommendations, and you can also assess the likelihood that the horse will be able to return to his former career."

"Sometimes it's a year before healing is complete," cautioned Garrett. "That can be hard for people to hear."

She also suggested that the judicious use of sedation can help in keeping "controlled exercise" controlled. "The last thing you want is the horse undoing all the healing in 20 minutes of exuberance the first time he is turned out."

Take-Home Message

Should your horse sustain a tendon or ligament injury, your vet can advise you on the optimal treatment options for the injury at hand, keeping in mind the goal of rebuilding tissue strength and elasticity.

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