Proceedings of the American Association of Equine Practitioners - Focus Meeting

Focus on Hindlimb Lameness
Oklahoma City, OK, USA – 2012

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Fort Collins, CO, USA

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Diagnosis and Treatment of Tarsal Pain

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Take Home Message

The most common source of tarsal pain in the Western performance horses is osteoarthritis of the distal intertarsal and tarsometatarsal joints. Various medical treatment options exist including NSAIDS, intra-articular medication, and extracorporeal shock wave therapy (ESWT). If the horse’s pain becomes refractory to these common medical treatments, laser-facilitated arthrodesis or intra-articular ethanol may be viable treatment options.

Introduction

Degenerative joint disease of the distal tarsal joints is a significant source of lameness in all disciplines of horses. Clinical signs of distal tarsal osteoarthritis are variable and may include gait abnormalities typical for tarsal lameness, including accentuated elevation of the affected limb, shortened cranial phase of the stride, and decreased arc of foot flight. The lumbar and gluteal region of these horses can become painful secondary to the abnormal gait. The lameness is usually exacerbated after a hindlimb flexion test. Radiographic changes may not be correlated directly with severity of lameness and MRI may be needed to definitively diagnose soft tissue and bone abnormalities such as bone edema secondary to trauma. The diagnosis of distal tarsal pain should be verified with intra-articular anesthesia of both the distal intertarsal and tarsometatarsal joints. Without proper diagnosis and treatment, performance diminishes and objectionable habits, such as refusing to turn a barrel pattern, often develop.

Many treatment options have been developed to alleviate tarsal pain. Most of which are focused on decreasing the inflammation in the affected joints. Non-steroidal anti-inflammatory medications, the use of intra-articular medications such as corticosteroids and hyaluronic acid, interleukin-1 receptor antagonist protein (IRAP) therapy, tiludronate, and ESWT are common. Horses that become refractory to this form of treatment often require surgical treatment to achieve soundness. The intent of this paper is to discuss various medical and surgical treatment options that are currently being used to address pain of the distal tarsal joints.

Medical Therapy

The use of a combination of hyaluronic acid and corticosteroids or either product used alone has become the mainstay of treatment for distal tarsal osteoarthritis in the performance horse. Some practitioners use high dose steroids to “promote the destruction of cartilage and bony fusion”, while others try to preserve the joint with less destructive means such as “low dose” corticosteroid in combination with hyaluronic acid (HA) or HA alone. Research presented over
the last several years would support a chondroprotective effect of many corticosteroids. Clinically the fusion processes is difficult to predict with many horses requiring years of injections with no radiographic evidence of bony fusion. The use of steroids to promote fusion may be contraindicated due to the prolonged effect corticosteroids can have on osteoblastic activity.

The author aims medical therapy at decreasing inflammation and synovitis, while promoting cartilage health as long as possible. I typically inject both the distal intertarsal and tarsometatarsal joints with 10 mg HA, 3 mg triamcinolone, and 40 mg of methylprednisolone. The duration of the injections ranges from 4-6 months with some horses obtaining relief longer, depending on the level of use after injections. In some horses, after multiple injections (6-8), the duration and efficacy of the injection tends to diminish. These horses may then become candidates for other forms of therapy discussed further in this paper. Duration of the injections can sometimes be extended with the concurrent use of intramuscular polysulfated glycosaminoglycans (PSGAGs) and/or intravenous hyaluronic acid.

**EWST**

Treatment of refractory pain of the distal tarsal joints with ESWT was first described by Dr. McCarroll. He reported on treating 74 horses with lameness ranging from grade 1 to 3. Each joint was administered 2000 pulses at 0.89 mJ/mm² with the primary focus point at the site or sites of radiographically apparent lesions. In the 74 horses, a total of 139 joints were treated. At the time of follow-up examination 90 days after treatment, 80% had improved at least 1 lameness grade. Of the 15 horses with no improvement, 8 returned for a second treatment and 4 of these horses improved. Clinically, the author uses the HMT ESWT at E6 with a 35 mm probe focused over the distal tarsal joints on the dorso and dorsomedial aspect delivering 500 pulses into each joint bilaterally. Some horses with moderate joint space collapse and periarticular new bone formation respond favorably to ESWT. The duration of pain relief is variable but provides the client with a non-surgical option for alleviating tarsal pain.

**Intra-Articular Ethanol Injection**

Recently the use of intra-articular ethanol in the tarsometatarsal joint (TMT) to facilitate ankylosis has been described. In a study of 24 horses, follow up lameness examination at 6-9 months revealed an overall improvement rate of 52%, with 11% of the cases showing deterioration in lameness with 2 cases becoming severely lame. The author’s concluding statements support the use of 70% ethanol but caution that an accurate contrast study be performed prior to injection and that the possibility of worsening lameness be discussed with the owners. The 2 cases that became severely lame both had osteoarthritis develop in the proximal intertarsal joint possibly due to contamination of this joint with ethanol. Both horses had contrast studies performed prior to injection with no visible communication. The uncertainty of the cause of the undesired effect post treatment has deterred me from currently utilizing ethanol ankylosis on a routine basis. In our practice, we have had 1 horse that improved in grade of lameness for 2-3 months and then became significantly more lame than pretreatment with ethanol. Once joint collapse occurs, further surgical treatment with the laser is more difficult to perform and less
likely to be effective. This may prove to be a viable treatment option, but should be used with caution at this time.

**Surgical Treatments**

*Cunean Tenectomy*

The cunean tendon is a medial extension of the cranial tibialis muscle that inserts distally on the first and second tarsal bones. Tension on the cunean tendon during weight bearing is thought to exert torsional forces on the lower tarsal joints. Removing a section of the cunean tendon decreases rotation of the lower joint decreasing pain.

The procedure is performed on the standing sedated horse using local anesthetic injected in an inverted “V” pattern just proximal to the palpable cunean tendon on the medial aspect of the tarsus. A 2 centimeter vertical skin incision is made over the tendon and a curved hemostat used to isolate and elevate the tendon from the incision. A one centimeter section of tendon is removed and the skin apposed with simple interrupted sutures using a non-absorbable suture material. A light bandage consisting of a sterile telfa pad, and elasticon is placed over the surgery site with a cotton support wrap applied over the light bandage for the first 48 hours after surgery to decrease swelling.

Postoperatively the horses are confined to a stall for 12 days with daily hand walking for 20 minutes. After 12 days, the interval of hand walking is increased to 30 minutes a day for an additional 10 days. Horses should be made to walk over poles on the ground or some form of exercise that requires the horse to flex the tarsus. Riding begins approximately 3 weeks after surgery and should include work over obstacles to make the horse maximally flex the tarsus. Regular work can be resumed 6 weeks after surgery. The surgery site may be slightly enlarged for approximately 2-3 months. Six months after the procedure most horses will have little if any cosmetic blemish.

The success rate of cunean tenectomy varies depending on the surgeon evaluating the procedure. An owner survey of 285 cases of bone spavin treated by cunean tenectomy showed 83% of owners believed that lameness and performance improved after the surgery and that they would have the procedure performed again. The success of this procedure is directly related to strict adherence to exercise protocols in the convalescent period. Exercise of horses over obstacles and early return to consistent exercise seem to be the most important factors.

**Osteophyte Removal**

Most owners associate the pain of arthritis with the formation of the “spurs” or osteophytes and believe resolution of the pain would occur with their removal. Osteophyte formation is assumed to be the result of degenerative change in the joint and not a cause of pain. When the osteophyte forms as a single large dorsal bone projection on proximal MtIII with demineralization of the adjacent third tarsal bone, surgical removal through a small arthrotomy many times will alleviate pain and need for further treatment. Horses are returned to full work 3-4 weeks after surgery.
Fenestration

The pathogenesis of distal tarsal pain is likely multifactorial including joint capsule synovitis, subchondral pain, and pain caused from increased intra-osseous pressure. Some horses with characteristic gait abnormalities attributable to distal tarsal pain exhibit minimal to no radiographic change, yet become sound with intra-articular anesthesia of the distal intertarsal and tarsometatarsal joint. If the pain is easily eliminated long term (4-6 months) with intra-articular therapy using hyaluronic acid and a low dose of corticosteroid, then a diagnosis of primary synovitis would be most likely. However, a large percentage of the horses seen by the author are referred with a history of minimal response to repetitive intra-articular therapy, and no radiographic evidence of degenerative joint disease of the distal tarsal joints. It has been shown that intra-osseous pressures greater than 45 mm Hg in the tarsal cuboidal bones is associated with pain. Tarsal fenestration in these cases should provide decompression of the cuboidal bones and alleviate pain.

The surgical technique utilized by the author differs from the currently described technique. The horse is positioned in dorsal recumbency under general anesthesia with the hind limbs suspended from stands allowing easy access to the medial aspect of the tarsus. The limb is circumferentially clipped from mid tibia to mid cannon bone, aseptically prepared and draped. Under fluoroscopic or radiographic guidance, a 3.2 mm drill bit is introduced through a stab incision on the medial aspect of the proximal third metatarsal bone, 2 cm distal to the tarsometatarsal joint. The bit is advanced through the third metatarsal bone in an oblique proximolateral direction penetrating the third metatarsal bone, third tarsal bone and half the thickness of the central tarsal bone. Care is taken not to penetrate the proximal intertarsal joint. The stab incision is closed with a single simple interrupted suture and a light bandage applied prior to recovery. Horses are stall confined with daily hand walking for 10-15 minutes until the sutures are removed at 12 days postoperatively. Light riding including long trotting and straight line work is recommended for 30 days before resuming light training.

Prognosis after this procedure has been reported as 62% cure rate based on a client survey one year following surgery in 40 cases. The authors concluded by stating that fenestration was their treatment of choice for bone spavin compared with other arthrodesis techniques.

Arthrodesis of the Distal Tarsal Joints

The goal of distal tarsal arthrodesis is to promote bony union of the joint thus alleviating pain. Since the distal tarsal joints are “low motion” there is minimal gait abnormality after arthrodesis. Two surgical techniques will be discussed under this section: conventional drilling technique previously described and laser facilitated arthrodesis.

Drilling Technique

The horse placed under general anesthesia and positioned in dorsal recumbency with the legs suspended allowing access to the medial aspect of the tarsus. The limb is circumferentially
clipped from mid tibia to mid cannon bone, aseptically prepared and draped. A 4-5 cm vertical skin incision is centered over the cunean tendon and 3-4 cm of the tendon removed. The author uses fluoroscopic guidance to place a 4.0 mm drill bit into the distal intertarsal and tarsometatarsal joints parallel to the joint surface. Three separate drill tracts are made in a fan shaped pattern to a depth of approximately 3 cm. The fluoroscope allows accurate placement of the drill and decreased overall surgery time. The skin is closed in routine fashion and a light bandage applied before recovery.

Horses are given 2 grams of phenylbutazone once a day for the next 5-7 day postoperatively, depending on pain level. Some horses are markedly improved within days after surgery, likely from previously discussed mechanisms decreasing intra-osseous pressure. Horses are stall confined for 2 weeks with the legs bandaged until the sutures are removed. Light exercise including riding or ponying is recommended for the next 30 days followed by return to full work if the horse is not painful. The convalescent period is variable with some horses requiring six months to a year to achieve soundness. In a retrospective study of 20 horses, 80% of the horses returned to full function after surgery. The clinical impression of the author is not as favorable. Clients are dissatisfied with the procedure due to the long convalescent period and variable success rate.

**Laser-Facilitated Arthrodesis**

A full series of radiographs including a good quality dorsoplantar view is helpful in planning the surgical approach and predicting prognosis. Radiographic changes with severe periarticular osteophyte formation or excessive mineralization of the joint capsule will necessitate modification of the laser procedure to facilitate placement of the laser fiber into the joint and may signify a less favorable prognosis after surgery.

Degenerative joint disease of the proximal intertarsal joint concurrent with degenerative change of the distal tarsal joints lends to a guarded prognosis for athletic soundness without periodic medical management of the tarsocruural joint after surgery. In cases of osteoarthritis involving the lower tarsal joints and the proximal intertarsal joint, a contrast arthrogram may be indicated to determine communication. If the joints communicate, heat and inflammatory components from the laser surgery may adversely affect the proximal intertarsal and tarsocruural joints.

The technique has been performed with the Nd:YAG, 980 nm diode and holmium lasers. The most common used laser today is the 980 nm diode. The horse is placed under general anesthesia in dorsal recumbancy and maintained with inhalant anesthetic. The hair is clipped circumferentially from an area extending from the mid-tibia region to the middle of the third metacarpal bone. The area is prepared in routine fashion with a surgical scrub. It is important to perform a final rinse with sterile saline to remove any residual alcohol from the surgical site; otherwise the heat generated by the laser fiber may ignite alcohol vapors on the surface of the skin. Multiple (3 to 4) eighteen-gauge 1.5-inch needles are placed on the dorso and dorsomedial aspect of the tarsus into the distal intertarsal and tarsometatarsal joints. Fluoroscopic or digital radiographic guidance greatly facilitates the accurate placement of each needle. These needles serve as a conduit for passage of the laser fiber and allow plume to vent out of the joint as laser
energy is delivered. Sterile saline is injected into the joint via previous placed needles to confirm correct needle placement and communication with the joint. A 600 micron conical-tipped laser fiber is introduced into the joint through the 18 gauge needles on the dorso and dorsomedial aspect of the tarsus. The laser is set to continuous mode at approximately 15-20 watts. Short pulses of energy are delivered by cycling the foot pedal until the fiber is felt entering the joint and plume is freely venting out of the 18 gauge needles. Once the fiber is in the joint, the power setting is adjusted to 10-15 watts and longer pulses of laser energy are delivered with each cycle of the foot pedal to achieve a constant boil of the synovial fluid. The laser fiber is slowly advanced into the joint to a depth of approximately 1 cm. The goal is to heat the cartilage by boiling the synovial fluid, not to pass the fiber across the joint. Lasing is continued until 300-500 joules of energy is delivered at each needle site. Cold saline solution is constantly dripped over the laser cannula during the procedure to prevent thermal necrosis of the skin. Needles are removed and a routine tarsal bandage applied.

Horses are given broad-spectrum antibiotics preoperatively and the following day. Two grams of phenylbutazone are given for 2-3 days after surgery depending on the comfort level of the patient. The surgery site is covered with a bandage for 10 days after surgery with bandage changes every 2-3 days. The horses are stall confined for 2 weeks after surgery with 10-15 minutes of hand walking beginning after the first 7 days. After 2 weeks, light exercise consisting of straight line trotting or big circles for 10-20 minutes is recommended. The author prefers that operated horses be ponied or ridden as opposed to lunging. This is continued for 30 days. The next month of exercise involves riding in a straight line or large circles at a trot and lope for 20-30 minutes each day. This is followed by a return to light training for an additional 30 days, avoiding sudden stops or tight turns. If the horse is sound at the end of 90 days of controlled exercise, it can be returned to a normal work schedule. Horses with advanced arthritis manifested by severe periarticular osteophytes, partial joint collapse, or periarticular mineralization may require low doses of phenylbutazone in the initial period of exercise. Stall confinement without return to exercise does not improve chances for future soundness.

The delivery of laser energy into the joint is paramount. Initial short bursts of energy at higher power settings allow the fiber to quickly advance through the joint capsule and become seated in the cartilage. The surgeon knows this has happened once plume or steam is evacuated out of the vent needles. If plume is not seen by the time 50-100 joules of energy is delivered, adjustments must be made before continuing. The two most common reasons for this occurring are a plugged vent needle or failure of the laser fiber to enter the joint. Excess energy delivered outside of the joint can lead to partial sloughing of the skin at the laser site or abundant periosteal proliferation on the medial aspect of the tarsus.

To avoid these pitfalls, accurate placement of the vent needles can be confirmed by injecting saline through the laser cannula to confirm communicability with the vent needle and the joint, or the tarsometatarsal joint can be distended from routine injection over the head of the lateral splint bone with saline. On rare occasions, multiple vent needles will need to be placed at sites distant from the laser portal to achieve adequate release of the plume.
The goal of laser-facilitated arthrodesis is to heat the cartilage and collagen in the surrounding joint capsule by boiling the synovial fluid until it vaporizes. Chondrocytes heated to 50 degrees centigrade will die and collagen heated to 60 degrees centigrade will contract. Chondrocyte death should eventually lead to collapse and fusion of the joint. The “collagen shift” that likely occurs in the joint capsule may provide stability of the joint, decreasing postoperative pain and facilitating fusion.

Data concerning success rates of this procedure have been evaluated retrospectively using the Nd:YAG laser. In that abstract, 24 horses (all western discipline horses except 1) went from grade 2 or 3 lame to sound. The horse that remained grade 1 lame after laser-assisted arthrodesis was non-weight bearing (Grade 4 lame) before surgery. All Standardbred horses had an increase in earnings postoperatively. Our clinical impression is that the diode laser is equally effective. Compared with the current techniques available, laser facilitated arthrodesis has many advantages. The two most critical to the athletic horse are a short convalescent period and a higher percentage of horses returning to soundness.

References and Footnotes


a. Personal communication, Marvin Beeman, Littleton, CO.
b. Personal communication, John McCarroll, Pilot Point, TX.