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Osteoarthritis of the Distal Tarsal Joints (Bone Spavin) in the Horse

By Ryan Shoemaker, DVM

Bone spavin is the most common hindlimb lameness diagnosed at the Western College of Veterinary Medicine and ranks second only to navicular syndrome (caudal heel pain) as the most common lameness diagnosis in the horse. Bone spavin is an osteoarthritis and periostitis that typically involves the tarsometatarsal, distal intertarsal, and occasionally the proximal intertarsal joints.[1,2] Osteoarthritis is widely recognized as a significant source of lameness in all disciplines of horse use,[3] although the disease is more often associated with mature performance horses that practice jumping or western performance horses used for reining, roping, barrel racing, or cutting. The most common treatments are oral nonsteroidal anti-inflammatory agents and intra-articular medications. Surgical therapies are typically reserved for horses that have become unresponsive to medical management. Recently developed surgical techniques have increased the success of returning horses to their intended use after medical therapy is no longer efficacious. This issue of *Large Animal Veterinary Rounds* reviews the risk factors for bone spavin, diagnostic techniques, and various treatment and management options for this common lameness.

Bone spavin has been arbitrarily separated into true spavin (jack spavin) and blind spavin (occult spavin). True spavin describes a horse that has variable lameness in the hindlimbs, localized to the distal tarsal joints. There is physical enlargement of the distal tarsal joints and radiographic evidence of degenerative joint disease. Horses with blind spavin often demonstrate the same clinical features of true spavin; however, physical and radiographic evidence of degenerative joint disease is lacking. The term "tarsitis" has been used to describe Standardbred racehorses and other performance horses with blind spavin;[4] the lameness in these cases is associated with inflammation in the periarticular soft tissues surrounding the small tarsal joints. Other clinicians consider blind spavin an intermediate stage in the progression of osteoarthritis in the distal tarsal joints.[1]

Predisposing risk factors

Any horse that is ridden hard at a gallop and canter is at risk for developing bone spavin.[1] In western Canada, clinicians commonly associate bone spavin with western performance and jumping horses because of the repeated stress and strain (compression and rotation) placed on the small tarsal bones in these types of competitions. Certain conformational abnormalities such as sickle-hock, cow-hock, or excessive straightness of the hindlimb may predispose horses to develop pain in the distal hock joints;[2] however, horses with good conformation can also develop bone spavin. Shoeing practices, such as shoes with outside trailers or calks, can predispose horses to developing osteoarthritis of the distal tarsal joints.[5] Other less-common scenarios include tarsal osteoarthritis secondary to infectious arthritis of the distal hock joints and malformed or incomplete ossification of the small tarsal bones in the neonate.[5]

Anatomy

There are 5 joints of the equine tarsus (Figure 1), they include:

- Tibiotarsal (Tarsocrural)

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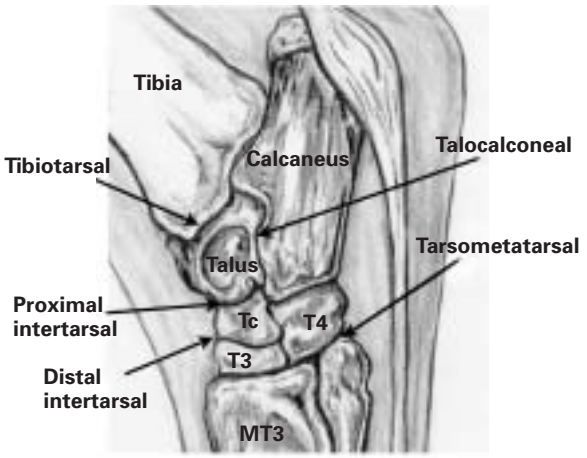
Figure 1: Lateral view of the equine tarsus showing the 5 joints.



- Talocalconeal
- Proximal intertarsal
- Distal intertarsal
- Tarsometatarsal

Typically, there is communication between the tibiotarsal, talocalconeal, and proximal intertarsal joints. The articulations affected by bone spavin include the distal intertarsal and tarsometatarsal joints and, occasionally, the proximal intertarsal joint.[4] The distal intertarsal joint is formed by the articulation of the distal surface of the central tarsal bone (Tc) with the proximal surface of the fused first and second tarsal bones (T1+2), and the proximal aspect of the third tarsal bone (T3).[4] The fourth tarsal bone (T4) spans the distal intertarsal joint laterally and articulates with the proximal intertarsal and tarsometatarsal joints. The tarsometatarsal joint is formed by the distal aspect of T1+2, T3, and T4 articulating with the proximal portion of the second, third, and fourth metatarsal bones (MT2, MT3, and MT4, respectively).

History

Generally, horses present to the practitioner for an evaluation of chronic, intermittent, low-grade hindlimb lameness. Owners and riders often report that the horse "warms out" of the lameness early in the disease process. Eventually, the severity of the lameness increases with increasing duration and intensity of exercise.[6] The majority of distal tarsal osteoarthritis cases are bilateral; however, the initial lameness may be unilateral or switch from side to side. Common historical findings include the horse appearing reluctant to take a particular lead and developing behavioral changes (eg, bucking or refusing to jump). In the case of western performance horses, an unwillingness to back up, stop abruptly, or turn in a particular direction are regular complaints.[4] It is also common for owners or riders to complain about back soreness in horses with osteoarthritis of the distal hock joints.

Physical examination for lameness

In many instances, there are no abnormalities detectable by visual examination or palpation of the hock region.[1] As bone spavin develops, there can be enlargement over the dorsal medial aspect of the distal hock joints corresponding to periarticular soft tissue thickening. Effusion of the tibiotarsal joint is not common unless there is arthritic involvement of the proximal intertarsal joint.[5] Frequently, palpable soreness is found in the epaxial musculature of the lumbar region. Some horses will wear the lateral aspect of the shoe or hoof wall disproportionately compared to the medial aspect, which results in a mediolateral imbalance.[1]

Practitioners understand that lameness can be extremely variable from horse to horse and the degree of osteoarthritic change in the distal tarsal joints does not always correspond to the degree of lameness. Evaluation of lameness in the hindlimb is generally considered to be more difficult than in the forelimb.[7] Recent kinematic research studies on experimentally-induced lameness in the distal intertarsal and tarsometatarsal joint demonstrated that fetlock and tarsal joint extension during stance decreased, fetlock joint flexion increased during the swing phase, limb protraction decreased, and vertical excursion of the tubera coxae became more asymmetric at the trot.[8] These movements are also typically observed in clinical cases of horses with hindlimb lameness associated with osteoarthritis of the distal tarsal joints.

One aspect of experimental findings that did not correspond with clinical observations during a lameness examination is an increase in hoof height during the swing phase of the stride.[8] Clinically, lameness examination at the walk may reveal a decrease in the cranial phase of the stride on the affected limb and a decrease in fetlock extension during weight-bearing.[5] The degree of lameness running in a straight line at the trot can be markedly variable (grades 2 to 4/5) using the American Association of Equine Practitioners lameness grading scale.[9] The lameness is commonly exacerbated when the horse is circled with the lame limb toward the inside. Circling the horse may reveal a bilateral lameness that was previously observed as unilateral. Tarsal flexion (upper limb flexion, spavin test) usually increases the severity of lameness in horses with osteoarthritis of the distal tarsal joints. Although the spavin test is not specific for the distal tarsal joints (or even the tarsus), bone spavin in performance horses is the most likely cause in these animals.

Diagnostic local anesthetic

Bone spavin is commonly diagnosed based on history, physical examination, upper limb flexion tests, and radiographic signs consistent with osteoarthritis of the distal tarsal joints. Intra-articular anesthetics may be required to localize the source of the lameness to the distal tarsal joints in cases where the diagnosis is equivocal. It is suggested that following intra-articular anesthesia, the lameness of the

Figure 2: Diagram illustrating the approach to the tarsometatarsal joint for intra-articular anesthesia.

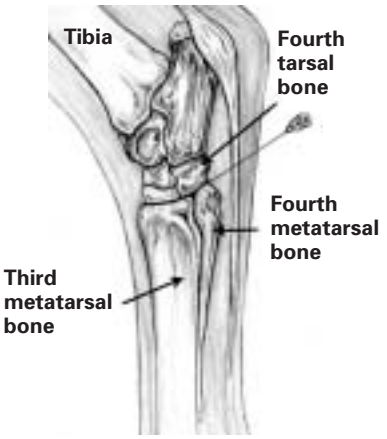
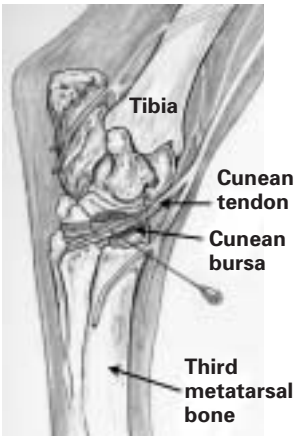


Figure 3: Diagram illustrating the approach to the distal intertarsal joint for intra-articular anesthesia.



horse should be evaluated several times during a 30-minute period.[4] A minimum of 60% to 70% improvement is considered to be a positive response; however, the vast majority of horses do not become sound.[10] Prior to intra-articular anesthesia, the clinician must be aware of the potential communication between the tarso-metatarsal joint and the distal intertarsal joint, ranging from 8% to 38%.[11,12] Recent literature suggests that after 15 minutes of injecting the tarso-metatarsal joint with a local anesthetic, 100% of the distal intertarsal joints will contain some local anesthetic via diffusion.[13] It is not uncommon for horses with osteoarthritis of the distal tarsal joints to dramatically improve after intra-articular anesthesia of the tarso-metatarsal joint. However, if there is little to no improvement following tarsometatarsal anesthesia, the clinician should block the distal intertarsal joint to rule out osteoarthritis of the distal joints. Local anesthesia of the tarsometatarsal alone or in combination with the distal intertarsal joint may be required for an accurate diagnosis (Figures 2 and 3).

Radiographic signs

Radiographic findings consistent with osteoarthritis of the distal tarsal joints include joint space narrowing, subchondral sclerosis and/or lysis, periarticular osteophytes or enthesiophytes (bone spurs), and periarticular bone proliferation (Figure 4).[1] However, a good correlation does not exist between the clinical lameness examination and radiographic findings of the tarsi,[14] therefore, the diagnosis of osteoarthritis of the distal tarsal joints should not be based solely on radiographs. It is also common for horses with early-stage bone spavin to have minimal to no radiographic abnormalities, or for a clinician to find radiographic evidence of ankylosis as an incidental finding. Radiographic lesions are commonly observed on the dorsomedial aspect of the tarsometatarsal and distal intertarsal joints.[1]

Treatment options

Treatment of bone spavin can be either medical or surgical. The majority of horses diagnosed with osteoarthritis of the distal tarsal joints initially undergo medical treatment prior to surgical intervention. The most successful medical therapy includes the combination of intra-articular medications, corrective shoeing, and systemic nonsteroidal anti-inflammatory drugs (phenylbutazone). Medical management is undertaken until the horse no longer responds to the therapy. The lack of response manifests as increased lameness as the animal becomes refractory to intra-articular medication, which gives < 8 to 10 weeks of pain relief,[15] alone or in combination with ongoing nonsteroidal administration.

Medical management

Corrective shoeing of the horse with osteoarthritis of the distal tarsal joints is based on the goal of encouraging breakover of the hind foot (decreasing stress on the small

Figure 4: Lateral oblique radiograph of the distal tarsus demonstrating joint space narrowing (arrow head) and marked periarticular bone formation (arrow).

tarsal joints) and providing the horse with medial to lateral hoof balance. Breakover is the point at which the heel just begins to lift from the ground. Early breakover can be achieved by trimming the toe (rolling the toe) and/or setting the shoe back on the hoof.[15] Avoiding shoes that place increased stress on the tarsus such as toe grabs or trailers is recommended; however, the career of the horse may limit the practicality of this recommendation.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are very effective in providing analgesia and decreasing the associated inflammation in horses with bone spavin. Phenylbutazone is the most widely-used NSAID for this purpose because of its efficacy, accessibility, and affordability. NSAIDs are commonly used in combination with intra-articular medications. The long-term complications of NSAID administration (eg, gastrointestinal ulceration and renal toxicity) should be considered in the arthritic horse. Recommendations typically include the administration of phenylbutazone (2.2 to 4.4 mg/kg) before an athletic event and the continued administration for 1 to 2 days.[15] At the Western College of Veterinary Medicine (WCVM), some clinicians recommend the administration of NSAIDs at the lowest dose required to achieve soundness for 3 to 4 days surrounding a competition. This is followed by 3 to 4 days without any medication before the cycle is repeated.

Intra-articular medication of the distal tarsal joints is another common treatment for bone spavin. The medications frequently used are corticosteroids or hyaluronic acid, alone or in combination. There is controversy over the outcome of chronic corticosteroid use to treat osteoarthritis of the distal tarsal joints. At this time, the possible destructive effect of various corticosteroids on the articular cartilage of these high load/low motion joints is unknown. Similarly, the notion that intra-articular corticosteroids can hasten the fusion of the small tarsal joints while decreasing the pain and inflammation associated with the arthritis is also unproven. The vast majority of horses with an accurate diagnosis of osteoarthritis in the distal tarsal joints will greatly improve following intra-articular treatment with corticosteroids. The problem arises when the administration of corticosteroids fails to improve the lameness or improves the lameness for only a short time. Some clinicians think that concurrent administration of hyaluronic acid intravenously or intra-articularly, or polysulfated glycosaminoglycans intramuscularly, will aid in the treatment of refractory bone spavin. It is also pertinent to remember that many clinicians inject only the tarsometatarsal joint. This may not be efficacious since most horses have concurrent osteoarthritis in the distal intertarsal joint and joint communication is often questionable. Some horses may require injections in both the tarsometatarsal and distal intertarsal joints to show a response to treatment. There is a common misconception that increasing the pressure of injection in the tarsometatarsal will create a communication with the distal intertarsal joint.[12]

Recent work by researchers at the Veterinary Teaching Hospital in Michigan suggests that an orally-administered neutraceutical containing a combination of the amino acids (glycine, proline, glutamic acid, glutamine, etc.) that make up chondroitin and glucosamine can improve gait symmetry in horses diagnosed with bone spavin.[16] Another medical therapy includes the use of extracorporeal shock wave therapy (ESWT) to deliver focused shock waves to deep tissues. Proponents believe that the waves promote bone remodeling, stimulate cellular metabolism, and provide short-term analgesia. Controlled studies are lacking; however, clinical experiences are encouraging.[17]

Surgical treatment

Surgical treatment should be considered in the horse that is no longer responsive to medical management of bone spavin. Numerous surgical treatments are used, including cunean tenectomy, the Wamberg procedure,[18] intra-articular drilling,[19-21] internal fixation with orthopedic plates or stainless steel cylinders,[22,23] laser-facilitated fusion,[24] chemical arthrodesis,[25,26] subchondral fenestration, and partial tibial/peroneal neurectomy.[27] Only a few of the commonly performed procedures will be discussed below as an in-depth review of all of the procedures is beyond the scope of this article.

Cunean tenectomy: Cunean tenectomy is a long-standing procedure for the treatment of bone spavin, although its efficacy is doubtful.[28] The procedure involves removing a section of the cunean tendon (medial extension of the tibialis cranialis) that is thought to contribute to the torsional stress of the distal tarsal joint and the direct pressure over the medial aspect of the hock. The procedure can be performed quickly in the standing or anesthetized horse.

Intra-articular drilling: Articular drilling utilizing the 3-drill tract technique[19] has been the standard treatment by most veterinary surgeons for the past number of years. This technique involves drilling along the articular surface of both the tarsometatarsal and distal intertarsal joint from the medial aspect of the limb. The goal in this therapy is to create a bony bridging of the apposing subchondral plates along the surgically-created drill tracts. Surgical success is reported to be 65% to 71%,[20,29] however, the convalescence period approaches 9 to 12 months.

Chemical arthrodesis: Chemical fusion of the distal tarsal joints involves intra-articular injection of sodium monoiodoacetate (MIA) following a contrast arthrogram. MIA causes chondrocyte death and eventual cartilage necrosis. Successful outcome was initially

reported to be promising;[25,26] however, recent literature[30] refutes this claim and agrees with clinical impressions that these horses are markedly uncomfortable following treatment for up to 2-3 weeks. Chronic lameness is also a concern in these horses.

Laser-facilitated fusion: Laser-facilitated arthrodesis is another promising treatment for bone spavin. The technique involves the use of either an Nd:YAG[24] or a diode laser[31] placed intra-articularly to achieve thermal destruction of the articular cartilage and surrounding collagen by boiling the synovial fluid until it vaporizes. Benefits of laser-induced arthrodesis include minimally invasive surgery and a short convalescent period. Initial studies showed marked success,[24] however, recent comparisons between laser-facilitated arthrodesis and the 3-drill technique were comparable.[31]

Research in arthrodesis

Current research at the WCVM is focused on a treatment for bone spavin that minimizes postoperative pain and facilitates the early return to function. We have completed a pilot study and are currently in the middle of a 12-month research project that is evaluating an alcohol-based chemically-assisted arthrodesis in the horse. In the pilot study, 30 days following intra-articular injection of the chemical in radiographically normal horses, there was radiographic and histologic evidence of articular degeneration. All horses were free of lameness at the time of injection and remained pain free for the duration of the study. The current project is also demonstrating very promising results; horses with intra-articular chemical injections are being followed with serial radiographs and lameness exams. Four months into the project, the horses remain lameness free and the radiographs reveal that the vast majority of joints are well on their way to fusion. The possibility that this treatment could be instituted in horses that have become refractory to medical therapy by encouraging rapid fusion, minimal postoperative pain, and little to no convalescent period is encouraging. The next step in the development of this treatment is a clinically-based research project on horses with naturally occurring osteoarthritis of the distal tarsal joints.

Summary

Bone spavin is a common lameness of performance horses. There will be variability in the presentation, diagnostic picture, and response to treatment from horse to horse. Current therapies can increase the return of afflicted horses to levels of performance obtained prior to the onset of lameness. The challenge for large animal veterinarians is to accurately diagnose and find a treatment that is efficacious for each individual horse with osteoarthritis of the distal tarsal joints.

Dr. Ryan Shoemaker *is a large animal surgical resident in the Department of Large Animal Clinical Sciences at the Western College of Veterinary Medicine. Dr. Shoemaker and Dr. Wilson are engaged in ongoing research in the area of bone spavin, in particular, the clinical application of alcohol-induced fusion of the small tarsal joints. The researchers are interested in enrolling horses from Western Canada in future clinical projects.*

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Abstract of Interest

Use of a three-drill-tract technique for arthrodesis of the distal tarsal joints in horses with distal tarsal osteoarthritis: 54 cases (1990-1999).

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OBJECTIVE: To assess the long-term clinical outcome of horses with distal tarsal osteoarthritis (OA) in which a 3-drill-tract technique was used to induce arthrodesis of the affected joints, identify any preoperative or operative factors associated with outcome, and describe any complications associated with the technique.

DESIGN: Retrospective study.

ANIMALS: 54 horses.

PROCEDURE: Medical records were reviewed for information on signalment, use, history, physical and lameness examination findings, surgical technique, and postoperative care. Radiographs were examined, and severity of OA was graded. Follow-up information was obtained through telephone interviews with owners at least 13 months after the procedure.

RESULTS: 32 (59%) horses had a successful outcome, 6 (11%) improved but were not sound after surgery, and 16 (30%) did not improve following surgery. Outcome was negatively associated with the previous use of intra-articular injections. Few postoperative complications were evident.

CONCLUSIONS AND CLINICAL RELEVANCE: Results suggest that distal tarsal OA in horses can be successfully treated by means of distal tarsal arthrodesis with a 3-drill-tract technique. Horses with advanced distal tarsal OA are likely to have poorer outcomes, and the procedure will likely be of minimal benefit in horses with concomitant causes of hindlimb lameness prior to surgery and in horses with preexisting proximal intertarsal joint disease.

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