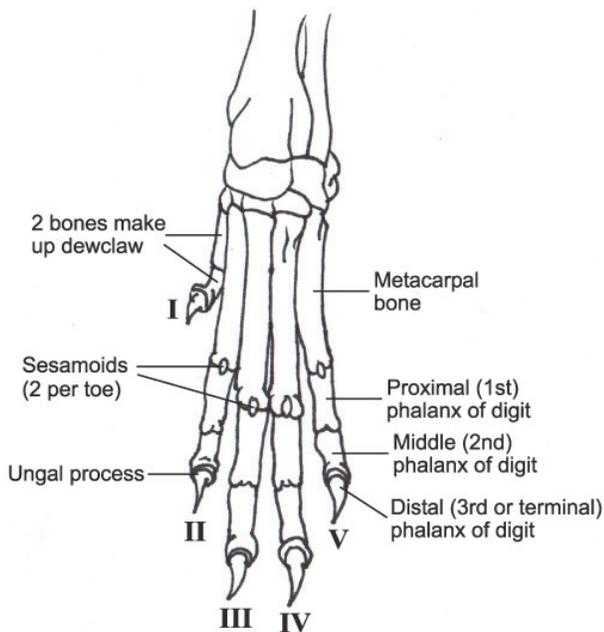


Why Toes Are So Important!

By Peter J. Lotsikas, DVM Diplomate ACVS, Diplomate ACVSMR & Faith M. Lotsikas, DVM, CCRT

In 2007, a hallmark article was published in *Clean Run* magazine documenting the incidence of sports-related injury amongst dogs participating in agility, either while training or competing. The survey determined that trauma of the digits accounts for 6-8% of the reported injuries, depending on the breed. Although seemingly a small percentage as compared to injuries of the shoulder and back, one must bear in mind that toe injuries are often missed or overlooked. The significance of this finding lies in that the paws are inversely proportionate to athletic ability. Missed or inappropriately treated injuries can result in decreased performance or even retirement of the canine athlete. As always, prevention and early recognition of any injury is crucial to keeping your canine partner on course.



Anatomy

Dogs have five toes per paw present in the forelimb (numbered I-V medial to lateral) and four toes per paw present in the hind limb (numbered II-V). Each toe is made up of three small individual bones with the exception of the dewclaw (digit I), which consists of two. The tip of the most distal bone becomes the unguis process, or nail bed. It is worthy to note that the dewclaw of the forelimb paw is the equivalent of a human thumb. Although it appears rudimentary in day-to-day activity, it is of vital structural importance to the wrist. As a dog takes sharp turns at speed, or comes down a steep contact, the dewclaw offers additional grip and stability.

Toes have an intricate network of tendons and ligaments, both of which can become injured. Tendons are fibrous cords attaching muscle to bone. Arising

from the various muscles of the forelimb they run beneath the toes as the “flexor” tendons, and on top of the toes as the “extensor” tendons. One of the more important flexor tendons of the feet is the superficial digital flexor tendon (SDFT). This tendon acts in part as a shock absorber for the impact of the dog’s weight contacting the ground, and also allows the nails to “dig in” for traction. With the exception of the dewclaw, each toe has paired sesamoid bones. Sesamoids are embedded in tendons at locations where tendons course over or under a joint and function to protect the tendon while maintaining consistent tension throughout range of motion. Toes also have ligaments, which are bands of fibrous tissue connecting bone to bone to form a joint. Collateral ligaments run on the medial and lateral aspect of the toes, and provide side to side stability.

Predisposing Factors of Toe Injury

There are multiple factors to consider in the prevention of toe injury. Achievement of tight turns and maintaining speed and accuracy all depend upon adequate traction. If we look at the most common breeds used in agility, many have an abundance of “foot fur,” which interferes with traction; particularly on wet or slick surfaces. In essence, a furry pad surface is much like trying to drive on bald tires in the rain. Regular trimming of the hair between the pads will help ensure the greatest amount of contact between the pads of the feet (which are responsible for most of the gripping) and the ground surface,

preventing slippage. Nails must be kept short; thereby reducing the risk of getting toes “caught” in grass or turf, and decreasing the risk of toe jams. Jamming of the digits occurs most frequently on contact equipment, with the A-frame being the most frequently implicated.

One should also consider the condition of the training and competition surface. Facilities with worn down indoor turf, excessively deep footing, or hard outdoor surfaces (usually the result of drought) should be avoided. In addition, older contact equipment can sometimes have a worn down surface, less traction, and the taller square slats that are associated with a higher incidence of injury.



It is our opinion there is a higher incidence of toe injuries seen in dogs that utilize a two-on/two-off contact technique. Mechanically, this makes sense. Because the dog must halt his inertia while on a decline that technically increases inertia, there is a resultant increase in opportunity to sustain concussive trauma or a jam. (The dog in the photo on the left has been trained to do a 2-on/2-off contact and you can see that he is already preparing for the stop at the bottom of the contact as he comes over the apex of the A-frame.) From a purely orthopedic point of view, there may be advantages to running contacts.

Sprains and Strains

A sprain is the stretching or tearing of a ligament. A sprained toe most often occurs when a toe nail stays fixed in a position while the rest of the body continues to move in a different direction. This will generally result in a stutter step or trip, but the dog is typically able to complete the course. Following rest, the dog is often sore or intermittently nonweight-bearing. Focal swelling may be noted over the joint involved, and the area will be tender to the touch. A complete tear of a

collateral ligament can result in dislocation of a toe, which will more likely result in immediate lameness. Treatment varies based on severity of the sprain. A low-grade sprain can often be treated with rest and an anti-inflammatory. Mid-grade sprains often benefit from laser therapy, therapeutic ultrasound, and manual techniques aimed at reducing pain and inflammation and promoting organized soft tissue repair. High-grade sprains or complete tears require either splinting or surgical intervention to repair the disrupted ligament and rehabilitation therapy following repair.

A strain is the stretching or tearing of a muscle or tendon. Toe strains characteristically occur as hyperextension injuries of the superficial digital flexor tendon on contact equipment. Hyperextension refers to a range of motion beyond normal extension. The toe can either jam into the slat or catch the edge, resulting in sudden upward bending of the toe. This can result in stretching, tearing, or complete rupture of the fibers of the flexor tendon(s). Clinical signs may vary from mild tenderness to an immediate lameness. More often than not, the dog only appears “off” for a day or two with an incomplete tear. However, incomplete tears that go unrecognized can heal as scar tissue rather than normal primary healing, making the tendon more susceptible to repeat trauma. This can eventually lead to complete disruption of the tendon, which results in a “flat footed” appearance. At this stage, the

tendon is non-repairable and a persistent gait abnormality (although likely not painful) can be expected. Treatment of these injuries again varies depending on severity of the strain. Sudden complete tears of the superficial digital flexor tendons can be repaired surgically; however, the failure rate of this repair is high. Rehabilitation therapy would be recommended in addition.

Digital Arthritis/Sesamoid Degeneration

Osteoarthritis (OA) of the digits is a common “incidental” finding on radiographs. OA develops as the result of joint instability, direct or indirect damage to the joint surface, or from faulty bone and cartilage development. Osteoarthritis is defined as the break down and eventual loss of cartilage within a joint. Once the cartilage starts to wear away, the underlying bone becomes exposed, causing painful rubbing of bone against bone. With enough loss of cartilage, the joint collapses on itself, resulting in loss of normal joint shape and joint instability. The body’s response to loss of cartilage and joint laxity is thickening of supporting structures and production of bone spurs along the edges of the joint. Dogs that participate in agility sustain repetitive trauma to their feet, particularly with heavy training in jumping. This puts agility dogs at a higher risk of developing osteoarthritis of the feet and degenerative changes of their sesamoid bones. The Greyhound and Rottweiler appear overrepresented for conditions of the sesamoid bones and Shelties are predisposed to immune-mediated conditions that can lead to arthritis of the lower limb joints.



X-ray of an 8-year-old Sheltie with severe osteoarthritis of the toes. Further investigation revealed an undiagnosed underlying immune-mediated condition common in Shelties that predisposed this patient to the development of osteoarthritis.

It has also been noted that dewclaw removal may alter the stability of the toes and paw during turning, thereby placing abnormal stress upon other structures like the wrist, inciting arthritis formation. Regardless of the primary cause, OA of the paw results in decreased range of motion, and consequently, a possible decrease in performance and comfort with usually manifests as increased times or course

faults. OA of the digits is treated in a similar manner of OA elsewhere in the body—weight management, joint supplements, anti-inflammatory medications, and range of motion exercises being the pillars of therapy. Rehabilitation therapy is often very successful in managing this life-long condition. Laser therapy, electromagnetic field therapy, hydrotherapy, and various manual techniques will offer pain relief, improved joint health, and improved range of motion and function.

Fracture

Fractures of toes are less common injuries in our agility patients, but do occur. Toes II and V are more likely to be injured during sport, and toes of the front limbs are more likely to be affected than those of the pelvic limbs. Non-surgical management with a splint or cast for 4-6 weeks is preferred if the fracture is toward the middle of the bone and can be aligned well under sedation. This method of management preserves blood supply, resulting in improved bone healing and yields the least down time. Surgical repair is indicated if the fracture is near the joint or adequate alignment and stability cannot be achieved through closed reduction. Even with surgery, a splint or bandage is often necessary for 4-6 weeks following repair. Fractures of the tip of the digit can be difficult to repair, and often lead to a poorly aligned or non-healing fracture. In these cases, removal of the nail bed and associated bone is considered curative. Return to sport is still expected in these cases.



Left: Fracture of the fifth digit of the right hind foot resulted in only a mild lameness.

Right: X-ray of the fracture on the left, three months following injury. Patient was managed with a splint and therapeutic ultrasound treatments. X-rays Penny & “Riz” Miller



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Preventative Medicine

Regardless of the type of injury to the digits, paw, or carpus, preventative medicine is key. In addition to the actual treatment modalities mentioned, a good rehabilitation therapist will teach you the basics of some manual techniques you can use at home to improve function. Institution of a consistent warm-up and cool-down routine, including both active stretches as well as passive range of motion and assisted stretching as appropriate, is very beneficial to maximize performance, prevent new injuries, and identify more subtle injuries such as toe sprains in a timely manner.

About the Authors

Dr. Peter Lotsikas is a Diplomate of the American College of Veterinary Surgeons and American College of Veterinary Sports Medicine and Rehabilitation. He graduated with a BS degree in Biology from Virginia Tech and a DVM degree from the Virginia-Maryland Regional College of Veterinary Medicine. He then completed a general small animal internship at Kansas State University, followed by a surgical internship at Dallas Veterinary Surgical Center. Dr. Lotsikas received his formal surgical residency training at Iowa State University. He specializes in treating conditions of the performance canine. He practices orthopedics & sports medicine at Crossroads Animal Referral & Emergency (CARE) in Frederick, Maryland. Additional information about Dr. Lotsikas is available at www.carefrederick.com.

Dr. Faith Lotsikas earned her veterinary degree from the Virginia Maryland Regional College of Veterinary Medicine. Early in her career practicing as both an equine and small animal veterinarian she found her interests lay in the musculoskeletal system, comprehensive lameness evaluations, and sports related injury treatment and prevention. For that reason, she became a certified canine rehabilitation therapist through the Canine Rehabilitation Institute. She now practices with her husband at Crossroads Animal Referral & Emergency (CARE) in Frederick, Maryland. Additional information about Dr. Lotsikas is available at www.carefrederick.com.