Owner's Manual: Know Your Achilles

deep details on your largest tendon

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The Achilles tendon is the largest tendon in the body and one of the more difficult injuries to treat in a runner. As a sports medicine podiatrist there are only a few injuries that lead me to advise runners that they have to take time off; Achilles tendinopathy is one of those diagnoses. The proper medical terminology no longer includes tendinitis when discussing injury of this tendon. A landmark paper in 1976 showed that under microscopic examination the injured Achilles tendon shows no inflammatory cells within the tendon but rather degeneration; therefore, tendinitis is not the proper term. This has led to a reater understanding in the treatment of this injury.

The Achilles tendon is formed from three muscles: the medial and lateral heads of the gastrocnemius muscle and the soleus muscle, which is beneath those two muscles. The gastrocs start above the knee and the soleus originates below the knee. This is an important fact to note when stretching this group. When the knee is locked during a calf stretch, it isolates the gastrocs; bending the knee helps to better stretch the soleus muscle. The soleus is also one of the main contributors to Medial Tibial Stress Syndrome (MTSS, commonly referred to as shin splints).

Anatomically, the Achilles differs from all the other tendons in the body due to the surrounding sheath. Most tendons are surrounded by a synovial sheath; the Achilles is covered by paratenon. This is a fibrous layer of tissue that provides the blood supply to the tendon. The paratenon can become inflamed and thickened, leading to a different diagnosis, paratendonosis.

The calf muscles fire to decelerate the forward motion of the leg when the foot initially contacts the ground, then the load is gradually increased on the tendon until you reach toe-off. At toe-off (propulsion) up to 6 to 8 times of your body weight is transmitted though the tendon. The tendon also serves to resupinate the foot; if the foot is overpronating, the Achilles has to work harder to compensate for the excessive pronation.

The most common cause of Achilles tendinopathy is overuse. Tendons will typically not get injured until they are fatigued. Other causes include lack of flexibility, excessive overpronation, changes in training terrain, changing shoes, training in the morning, increases in training intensity, adding speed work or hill work. Two miscellaneous causes include prior use of oral steroids and the antibiotic class known as Quinolones, which includes the commonly prescribed drug Cipro (ciprofloxacin).

Stop and Stretch

The single most important aspect of treating this injury is early intervention and treatment. Rest is paramount for this injury to improve. As is the case in the beginning of most injuries, it will warm up initially at the start of a run and the run can be completed pain free. My rule of thumb is that if there is swelling, burning and/or pain, you should take some time off from running.

I recommend static calf stretching for five minutes three times a day, holding the stretch for one minute at a time with short breaks. There are other methods of stretching that may be just as effective (PNF, contract/relax and the Wharton methods) but static stretching is very safe. It is crucial to keep the foot flat on the ground because the gastroc-soleus muscle group cannot stretch unless it is relaxed; runners should never hang off a step or curb and feel the stretch in the tendon itself.

It's important to note that tendon fibers are inelastic. Only muscles can be stretched. When you feel the stretch in the tendon you may actually be causing damage to the tendon: Damage occurs when the tendon is stretched 4 percent beyond its strain level and rupture occurs at 8 percent beyond its relaxed state. For the normal tendon, that's only about a quarter of an inch. Therefore it's very important only to feel the stretch in the calf muscles.

You can combine icing and stretching when seated with your foot in a bucket. Fill the bucket with ice cubes and water and gently stretch the tendon with toes up on the wall of the bucket. It is my opinion that NSAIDS such as ibuprofen (Advil, Motrin) or naproxen (Aleve) should not be used more than a few days since they will not help a degenerated tendon.

Massage is another excellent treatment but it should be performed in different locations of the tendon depending on whether it is tendinosis or paratendonitis. When there is more diffuse swelling and one can feel crepitus (a crunchy feeling) then this is more closely associated with inflammation of the paratenon. When it is more focal (localized), and lumpy (nodular), then the problem is within the tendon itself. One good test to determine which structure is causing the injury is to move the tendon through a range of motion, grasp the painful area and move your foot up and down. If the painful area stays in one spot then it is the paratenon; if the painful area moves then it is the tendon. Tendinosis responds well to massage directly on the area, whereas paratendonitis responds better to massage above the injured area, up towards the calf muscles.

Strengthen

When the injury starts to enter the chronic stage of longer than two to three weeks, strengthening exercises need to be added as part of the treatment plan. Start with toe raises of both feet, build up to 50 using pain and fatigue as your guide. The next level is to perform single leg toe raises, again building up to 50 on each leg. The final phase is to perform these exercises off a step; this is known as an eccentric exercise as the muscle is lengthening and firing at the same time (see www.runningtimes.com/jan08 for a demo). Rise up with two feet and drop down off a step with one.

In 1998 Dr Håkan Alfredson published his prospective study on treating chronic Achilles tendinosis. Thirty recreational runners were split into two equal groups. The group that was rehabbed using eccentric exercises all returned to running in 12 weeks. The group that was rehabbed only using rest, stretching, orthotic devices and PT modalities all failed to improve and some were even treated with surgery. Alfredson recommended three sets of 15 repetitions, twice a day,daily with no off days.

Sometimes it is important to look above the foot and see how the core muscles are impacting the biomechanics. Strengthening of the hip abductors is oftentimes an integral part of the treatment plan. (See www.runningtimes.com/jan08 for key exercises.)

See your doctor

When you reach the chronic stage it is time to see your sports medicine professional. At this point if you have tried many of the above suggestions then an MRI may be recommended to inspect the tendon for cysts or a chronic tear. If you are a moderate to severe overpronator then a custom orthotic device may help correct the causative factors.

Working with a sports physical therapist has been critical to the successful treatment of my patients with this injury. Modalities such as electrical stimulation and ultrasound can help to improve this injury, combined with a therapist teaching proper technique for stretching and strengthening. There are several studies that support a hypothesis that therapeutic ultrasound can help repair injured tendons. When all the treatments fail and the injured tendon is preventing normal activity, then the use of a removable walking boot to completely immobilize the tendon should be considered. Remember that this must be followed by a rehabilitation of the muscles because atrophy will occur from immobilization.

Extracorporeal Shock Wave Therapy (ESWT) has also shown to be somewhat effective in treating this injury. It is more known for use in plantar fasciitis but has shown to be successful for insertional tendon injuries. Shock wave therapy theoretically promotes the formation of new blood vessels in the treated area to promote healing of the tissue. The downside is that ESWT can be very expensive -- it can cost as much as $7,000 -- and most insurance companies do not cover this treatment.

The last resort is surgical intervention. Dr Amol Saxena, a top sports medicine podiatrist in Palo Alto, CA, has successfully operated on the Achilles of many Olympians. When is it time for runners to consider surgery? "When they have done all the non-surgical things, rested completely from running three to six months, when they have pain after every run or they are limping," says Dr. Saxena. Overall, 90 percent get better without surgery, but a recent study conducted by Dr. Nicola Maffulli, Professor of Trauma and Orthopaedic Surgery at Keele University School of Medicine in the United Kingdom, showed that rest, ESWT and eccentric exercise only reduced symptoms in about 30 percent, 60 percent and 60 percent of the patients studied, respectively. The majority of Dr. Saxena's patients get back to prior activity levels within two to six months.

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