

ACHILLES TENDON INJURIES

By Dr. Joshua Dubin

Achilles tendon injuries are painful and can seriously hamper a triathlete's ability to train appropriately. The Achilles tendon is a strong, non-elastic, fibrous tissue on the back of the leg that attaches the gastrocnemius muscle (Figure 1A) and the soleus muscle (Figure 1B) to the calcaneus (heel bone). This tendon is surrounded by a paratendon, a thin, delicate sheath. Ground-reactive forces associated with running may reach 6-8 times body weight with an average of 800 foot strikes per mile. Under normal circumstances, the Achilles tendon is able to adapt appropriately to increased workloads associated with running. However, certain

risk factors may predispose the Achilles tendon to injury (Table 1).

Table 1. Risk Factors Associated with Achilles tendon Injuries*Pronation of the foot and ankle occurs shortly after the foot strikes the ground and consists of the following movements:

- 1** The heel bone turns outward (everts), and the medial longitudinal arch (in step arch) lowers towards the ground.
- 2** The leg moves forward over the foot (ground-reactive dorsiflexion).
- 3** The forefoot turns outward (abducts) (Figure 3 = now figure 2)

performance but dissipates when the workout ends.

Grade 4: Pain does not allow participation in sports and is present during activities of daily living.

Usually, the athlete will seek treatment when pain hinders performance. Most Achilles tendon injuries respond favorably to conservative care.

TREATMENT OF ACHILLES TENDON INJURIES

Depending on the severity of the injury, if the proper treatment protocol has been initiated, the athlete may be able to return to running in approximately 2-4 weeks.

However, it may take tendons 40-50 weeks to regain pre-injury strength. The injured

athlete has to be patient. If running is resumed too early in the healing process, it will exacerbate the injury and set back the healing process.

GOALS OF THERAPY INCLUDE THE FOLLOWING:

- reduce pain and promote healing;
- incorporate pain-free modified training to maintain fitness;
- correct or minimize risk factors;
- gradually re-introduce pain-free activity;
- develop realistic training goals.

USEFUL TREATMENT MODALITIES INCLUDE THE FOLLOWING:

- Deep tissue techniques, such as the Graston Technique and Active Release Technique, to break up scar tissue and restore soft tissue motion. There is considerable clinical evidence to support the effectiveness of deep tissue procedures in treatment of strain/sprain injuries. It may also be beneficial to add a daily self-myofascial regimen to the treatment protocol.

- Modified training with cycling, swimming, or water running to maintain cardiovascular fitness.

- Ultrasound and electric muscle stimulation combo therapy to aid in the healing process and decrease pain.

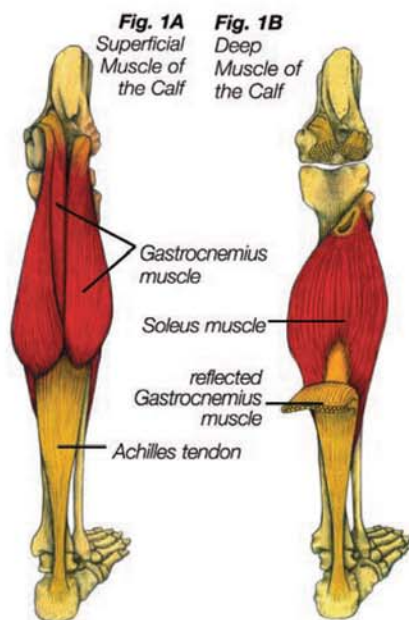
- Manual adjustments to the ankle and foot to free up joint motion.

- A strength training program for the gastrocnemius and the soleus musculature, including seated and standing calf raises (Figure 5A and 5B –now figure 3A and 3B). Dorsiflexion strengthening exercises should also be implemented to increase the strength of the tibialis anterior and extensor musculature (Figure 6-now figure 4).

- Strengthening exercises should progress appropriately with little or no discomfort.
- Proprioception exercises conducted on a dynadisc or a wobble board.

INTRINSIC RISK FACTORS (WITHIN SELF)	EXTRINSIC RISK FACTORS (EXTERNAL TO SELF)
<p>LOWER LIMB STRUCTURAL ABNORMALITIES</p> <ul style="list-style-type: none"> • pes planus (flat foot, which may lead to excessive pronation*) • pes cavus (high arch, which may limit shock absorption) <p>POOR CONDITIONING</p> <ul style="list-style-type: none"> • overweight (body mass index > 30kg/m2) • insufficient muscle endurance • insufficient muscle strength • limited flexibility <p>AGE-RELATED DEGENERATIVE CHANGES</p> <ul style="list-style-type: none"> • especially noticeable after 4th decade of life <p>HISTORY</p> <ul style="list-style-type: none"> • previous Achilles tendon injury 	<p>TRAINING PROGRESSION</p> <ul style="list-style-type: none"> • inappropriate intensity, frequency, or duration of training • hill training that does not progress gradually <p>GEAR</p> <ul style="list-style-type: none"> • unsuitable footwear <p>TRAINING SURFACE</p> <ul style="list-style-type: none"> • hard, uneven ground <p>TYPE OF SPORT</p> <ul style="list-style-type: none"> • activities that involve repetitive running and/or jumping

TABLE 1



Pronation of the foot and ankle allows the lower extremity to be more efficient in absorbing ground-reactive forces. Over-pronation, ill-timed pronation, or limited pronation may predispose the Achilles tendon to injury. The first two are common in pes planus and the latter in pes cavus.

Symptoms of Achilles tendon injuries may include one or more of the following: localized pain over the inner aspect of the tendon near the heel, a palpable bump at this location, and/or diffuse tenderness throughout the length of the surrounding paratendon.

Severity of symptoms and level of injury are generally scored on a four-grade system:

Grade 1: Pain is present at the end of the workout but is minimal.

Grade 2: Pain is present during the workout but does not affect performance.

Grade 3: Pain during the workout affects

- A flexibility program to stretch the soleus and gastrocnemius musculature on a slant board or step (Figure 7A and 7B-now 5A and 5B).
- A night splint to maintain the ankle in slight dorsiflexion and aid in alleviating morning stiffness in the Achilles tendon.

The athlete needs to understand that training through pain will be detrimental. There are no exact studies indicating when to re-introduce sport-specific training; however, the following are useful guidelines:

- If there are no time-specific training goals, cease sport activity for 2 weeks, and maintain cardiovascular fitness with modified training.
- After 2 weeks of modified training and conservative therapy, re-introduce pain-free running on a soft track or treadmill, at approximately 50 percent of the pre-injury intensity and duration.
- Increase the duration of the training runs by 10 percent each week. The rehab goal is to reach a pre-injury duration in 5-6 weeks.

- Increase the intensity only after the pre-injury duration is obtained.
- Hill training should gradually be added to the training schedule because it increases the workload on the Achilles tendon.

Before re-introducing sport-specific training, the following methods may reduce the workload on the Achilles tendon, and limit the chance of re-injury:

- Buy proper running shoes. A pes cavus foot structure may benefit from a cushioned sneaker. A pes planus foot

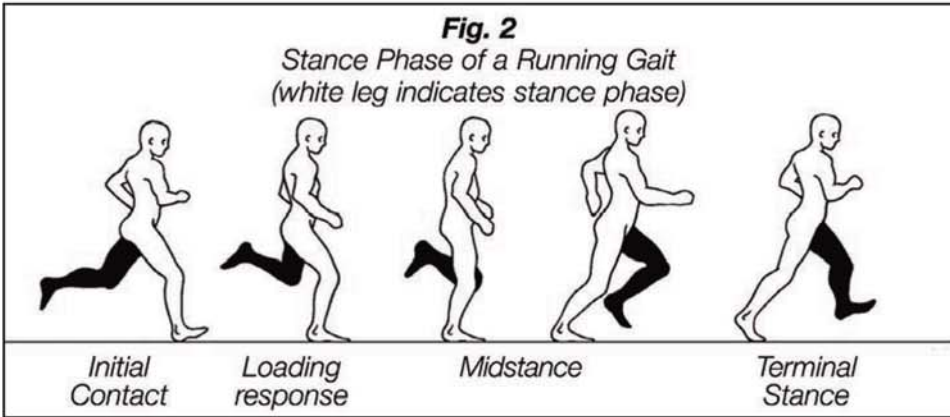


Fig. 3
Pronation of the Foot
(right leg)

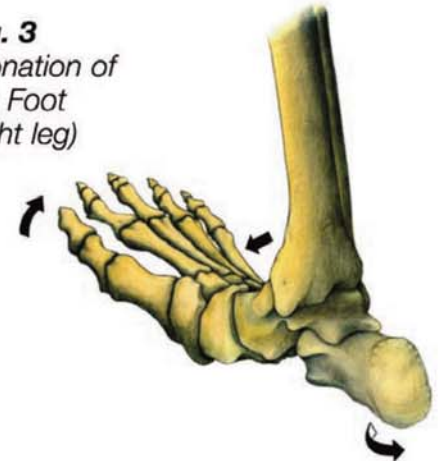


Fig. 4
Bowstring Effect on the Achilles tendon
(right leg)

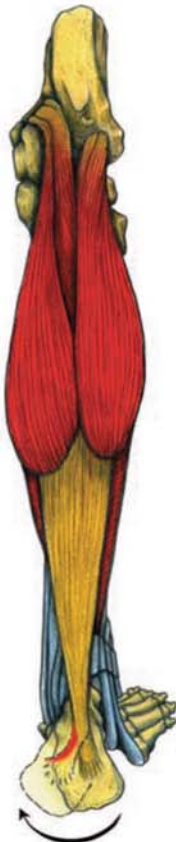


Fig. 5A
Standing Calf Raises

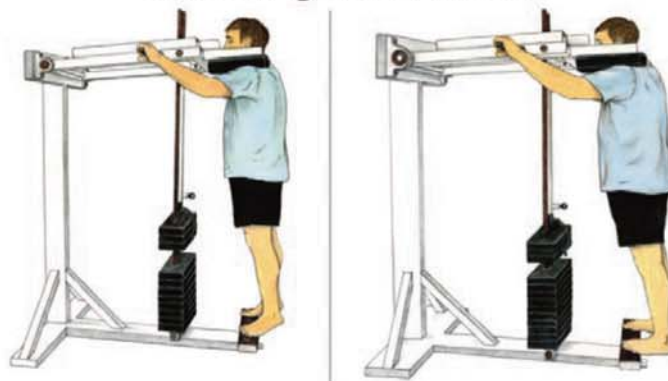
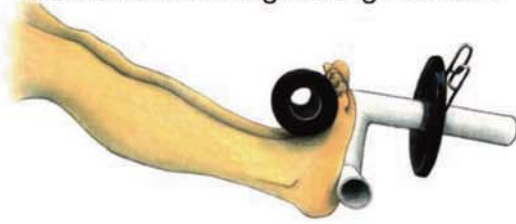


Fig. 5B
Seated Calf Raises



Fig. 6

Dorsiflexion Strengthening Exercise



structure may benefit from a motion control sneaker. Change running shoes every 300-500 miles. A sneaker loses approximately 50 percent of its ability to absorb ground-reactive forces after 300-500 miles.

- Kinesiotape and leukotape may aid in supporting and stimulating the Achilles tendon and in limiting pronation.
- Develop a nutritional meal plan for healthy weight loss and maintenance.

Most Achilles tendon injuries respond favorably to conservative care. Slowly responding Grade 4 Achilles tendon injuries may need to be immobilized in a walking boot for a period of 4-6 weeks, followed by conservative therapy. Surgery should be considered if the Achilles tendon does not respond to a prolonged course of conservative therapy and the athlete desires to return to sports. ■

Dr. Joshua Dubin practices in Quincy, Mass. He has been a member of the Team USA medical staff since 1996. The full referenced article on Achilles tendon injuries and other common sport-related injuries can be found at www.dubinchiro.com.

Fig. 7
Calf Stretches

Fig. 7A
Soleus
Stretch

Fig. 7B
Gastrocnemius
Stretch

