



# A Quick Look at Running Injuries

Look for these common conditions in runners and joggers.

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Each day millions of Americans run. From the elite athlete to the casual jogger, runners hit the trails or the track for fun, sport and health. Running is one of the most frequently employed forms of vigorous aerobic exercise often used to assist in weight control and ease stress. It may be helpful for depression, lower the risk of metabolic syndrome, lower blood pressure and lower total cholesterol, while increasing HDL's.

Running is relatively safe and usually results in enhanced health. George Sheehan often said that he did not believe that running would make him live longer, but would help him live better and healthier. Running involves greater forces than walking, swimming or cycling. Treatment and prevention of running

## FIGURE 1: Risk Factors

A variety of contributing factors to running injuries should be noted:

- Overuse or training errors
  - Inexperience
  - Terrible Too's
    - > Too much, too soon, too often, too fast
  - Intensity
- Miles run per week
  - Perhaps but may be related to overuse/rapid load increase
- Previous running injury
- Incorrect shoe
- Flexibility issues
- Strength issues
- Surface issues
- Abnormal biomechanics

injuries are closely related. As your interest and skill in treating runners grows, contact local quality running stores and running clubs and offer talks to the running clubs on injury prevention.

### Approaching Running Injuries (Figure 1)

The most frequent cause of running injuries is thought to be tissue overload. Historically termed the "terrible too's" the features are easy to remember: Too much, too soon, too often, too fast, with too little rest and recovery all too often lead to injury. Not long ago the "Sudden Runner's Syndrome" was seen in which runners had a plan to start running tomorrow and complete a marathon in 6 months. Today many begin HIT or high intensity training

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workouts without a gradual increase in load. This can result in a considerable number of injuries. The new athlete needs cautious guidance and should be encouraged to continue their exercise regimen with modifications for gentle adaptation (Figure 2).

Contributing to overuse injuries is the overused or mismatched shoe. It is important to examine all aspects of your patient's use of running shoes including fit, design, age and use including the differences in training and racing shoes.

When you treat experienced runners, they will rarely want to hear the advice "stop running". Save that for severe injuries. Keep in mind the concept of relative rest. Advise your runners to avoid running to the point of pain or what would create pain following the run. Review their training schedule and try to determine what activities are possible that will not cause a rebound increase in pain. Prescribe alternative forms of exercise that may be less stressful such as cycling, pool running, swimming, or the elliptical trainer.

### Assessment of Problem: History

The lower extremity is the area most often injured in running, with the knee, Achilles tendon, tibia and foot being the most frequently affected structures. Besides the usual questions regarding time and nature of onset, type of pain and so on, you will need to spend considerable time reviewing your patient's training schedule, other metrics and their training and racing shoes.

Biomechanics is only part of the problem and will only

## FIGURE 2: Exercise Regimen Modification

- Relative or absolute rest
- Strength exercises
- Stretching
- Footgear changes (sometimes a return to what has worked)
- Form changes  
(including avoiding over-striding)
- Orthotics
  - Foot to orthotic conformity
  - Adequate heel cup depth
  - Frictional characteristics to decrease slipping
  - Load/deformation characteristics
  - Modern casting technique
    - Avoid 2D scanning and foam casting
  - Medial skive and inverted technique for rearfoot control

offer a portion of the solution to most running-related injuries. As we have noted, most running injuries are caused by overtraining and it is important to evaluate where the training error was made. Correcting overtraining is not usually sufficient to treat many of the problems seen in clinical practice. It is critical to include assessment of recovery and where and how load reduction can be achieved. Shoe changes, running form evaluation, lower extremity strength



Figure 9, A and B: A variety of materials can be used in the fabrication of orthotics for runners.

Figure 11: Aged orthotics should be replaced



Figure 10, A and B: The flexion stability test is easily performed. Hold the heel of the shoe and press it into a flat surface at about 45-60 degrees. The shoe should bend at the ball of the foot (A). If it bends proximal to this point (B), it fails the test.

improvement, core body strength, and stretching to enhance flexibility need to be prescribed as well as a revised training schedule. Sleep, nutrition, and even individual genomics come into play in prevention and treatment of running injuries. Orthotics, of course, do play a role in the treatment and prevention of future running related injuries (Figures 9, 11) but the other parts of the equation must not be neglected.

### Training Evaluation and Assessment (Figure 3)

Ask your patients to bring in their running logs. These logs should have daily and weekly mileage and brief notes on the run. A variety of devices and apps are useful to record and monitor sleep, nutrition, and mood to help you assess the training load. Feelings of pain and discomfort should also be included in the running

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log (Figure 8). You'll be able to see when an injury began and what training preceded the injury. Look for sudden increases in mileage. Look for a large jump in the long run. Usually in marathon training the long run will only increase by one to two miles per week. An increase of three or four miles in the long run and the absence of "easy" weeks, during which there is a decrease in mileage are red flags.

Note the time of day and the type of terrain your patient has been running on. A change to running on hills may aggravate plantar fasciitis or Achilles tendonitis. Downhill running often aggravates peri-patellar pain syndrome. Running at night or in dim light conditions may aggravate mild balance impairment. A patient recovering from an ankle injury may need to run in daylight if a proprioceptive deficit remains.

Gait changes that occur with an increase in speed work include an increase in the number of strides per minute and an increase in stride length. Over-striding is one of the most frequent training flaws and among other deleterious effects this may aggravate calf and Achilles tendon problems, hamstring injuries, and increase stress in the anterior tibial muscle group.

### Physical Examination

The physical examination will lead you to direct knowledge of what structures are injured. You should also perform a thorough biomechanical examination, evaluate muscle strength and determine which muscle groups require stretching or strengthening.

When performing a physical examination I follow the principles of "Look, Touch, Move." I start away from the area that I suspect will be most tender and then work towards it. This limits responses from the patient anticipating pain.

### Shoes

It is clear to most that shoes play a role in the cause, the prevention and the treatment of running injuries (Figure 4). Even Abebe Bikila, the barefoot winner of the 1960 Olympic Marathon, decided to wear shoes while winning the 1964

## FIGURE 3: Outline of Training Evaluation

- Check for Overtraining
- Excessive racing
- Running with pain
- Running while injured or after injury
- Terrain
- Time of day
- Recovery
- Sleep
- Nutrition: Improper diet including inadequate dietary protein or insufficient caloric intake

## FIGURE 4: Shoe-Related Problems

- Excessive shock absorption:
  - Achilles tendinopathy—eccentric overload of tendon
  - Plantar Fasciitis—often too unstable, with little flexural and torsional stability
- Lacing System:
  - Met-cuneiform exostosis
  - Dorsal intermediate cutaneous nerve compression
  - Anterior ankle impingement
- Lack of Heel Padding: Haglund's
- Improper Fit:
  - Subungual hematoma
  - Blisters
  - Too Narrow Width: Neuroma pain

Olympic Marathon. Over the past several years trends have brought us everything from minimalist shoes to maximalist shoes. We have seen proponents of forefoot strike and barefoot running. Avoid being swayed by trends. One formula does not work for everyone.

Be sure to examine your running patient's shoes. How long have the shoes been worn and for how many miles have they been worn? What is the overall appearance of the shoe? What is the primary feature? Is the main feature mushy cushioning, a rocker sole, a forefoot emphasis on design or motion control? Has the upper shifted abnormally? Is the heel or sole excessively worn? Is the wear symmetrical? Do the characteristics of the shoe increase the risks for the type of injury that the patient has?

The aging shoe exhibits more than just a worn sole (Figure 10). The midsole compresses and loses its shock absorption. The heel may no longer sit perpendicular to the ground. The upper may have holes in it and may no longer line up properly with the rest of the shoe.

### Cross Training

The injured athlete needs to continue exercising in some fashion. Encourage and suggest cross training. You should assist the athlete in setting up their alternative exercise

schedule. There is a wide variety of exercises to choose from. The specific injury must be taken into account for the decision making process. Some of the possibilities include cycling, indoor cycling, swimming, elliptical, alterG, and upper body strength training. Recommend exercises that are not likely to delay healing.

### Foot Types

Different foot types have different basic shoe requirements. The high arched cavus foot presents a higher lateral load to the shoe and will not do well with a spongy midsole and a motion control shoe. The shape of the last should also be matched to the shape of the patient's foot. A wide foot will need a shoe wide enough to accommo-

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date it. If a patient has avoided injury with a specific shoe model, that should be taken into account when making a shoe recommendation. Shoe type should not be arbitrarily changed and patients should not change shoes because of social pressures.

### Most Common Injuries

The most common running injuries reported are to the knee, calf and Achilles tendon, medial tibia, and heel. The specific injuries most often reported include: patello-femoral pain syndrome, calf and Achilles tendon injury, ilio-tibial band syndrome, medial tibial pain, heel pain and sesamoid injury.

Other notable injuries include stress fractures of the metatarsals, tibia, hip and femur.

### Tips On Selected Injuries

#### Achilles Tendon & Calf Injuries

The calf and Achilles tendon are the most often injured in the lower leg region. Your patients with this problem should be advised to avoid hills. They should also avoid shoes that are either too rigid or have excessive cushioning. Shoes that are too soft exhibit an excessive deformation of the heel. The calcaneus is moving downwards when it should be on solid ground. The muscles leading to the Tendo Achilles reflexively fire to control ankle plantar flexion after foot strike. The eccentric contraction causes the muscles to effectively fire earlier, longer and stronger than usual.

I recommend gentle stretching after a 10-minute easy

## FIGURE 5: Medial Tibial Stress Syndrome

- Relative rest
- Get off of concrete
- Shorten stride
- Lessen medial tibial forces
  - Decrease bending forces in tibia
  - Lessen strain along posterior tibial tendon
- Wobble board for strengthening
- Check shoes: stability is often helpful
- Trial of OTC insert
- Custom orthotic to reduce pronatory moments of force
  - Inverted cast technique
  - Medial (Kirby) skive

warm-up and gentle stretching after running. In resistant cases, some researchers have recommended eccentric stretches. Heel lifts are often helpful, and the use of orthotics should be considered to eliminate tri-planar stress through the Achilles tendon.

During the recovery phase the patient should use relative or absolute rest. An elliptical trainer is often helpful. The treadmill should be avoided because the gait alterations that occur are not conducive to recovery from this injury. When returning to outdoor running a shortened stride may help reduce strain in the Achilles tendon (Figure 6).

## FIGURE 6: Achilles Tendon and Calf Injury Treatment Outline

- Relative rest
  - Cut back mileage
  - Lower intensity
  - Avoid hills, speedwork, plyometrics
  - Consider a bilateral 4-10 mm additional heel lift
- Avoid over-stretching
  - Gentle stretch after warm-up
    - Start with straight leg calf stretch, build up much later to bent leg.
    - Consider eccentric stretch even later.
- Ice Massage—10 to 20 minutes after exercise
- NSAID's—Aleve, Motrin, etc. 10-14 days.
- Check Running Shoes
  - Replace if heel is worn
  - Replace if excessive heel shock absorption (soft air sole cushion, excessive visco-elastic shock absorption)
  - Replace if shoe is excessively stiff at the “break point” (ball of foot).

### Medial Tibial Stress Syndrome

Until recently, the term “shin splint” was used to refer to many lower leg pains which included both bone and soft tissue injuries. Medial tibial stress syndrome (MTSS) is a more appropriate and specific term for what had been called medial shin splints. It must be distinguished from a tibial stress fracture using clinical onset and location of pain. The pain of MTSS is reported at the medial aspect of the leg, adjacent to the medial aspect of the tibia. Tenderness is usually found between 3 and 12 centimeters above the tip of the medial malleolus at the postero-medial aspect of the tibia. The area of tenderness is more longitudinal in the medial tibial stress syndrome rather than the often-seen horizontal zone of tenderness in a stress fracture. Periostitis may also occur in this location.

The injured structures usually include posterior tibial tendon and muscle; however, both the flexor digitorum longus and flexor hallucis longus may also be involved.

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A bone scan may be used to assist in the diagnosis. Compartment syndromes may also occur in this region.

The primary causes of MTSS are overtraining combined with forces that create tibial bending. The associated foot type is often found to have a high supination resistance or stiffness. Running on a canted surface or excessive track training will place the

higher leg (or outside leg) at a greater risk for this injury (Figure 5).

Your patients should be advised to diminish their training. While running on soft surfaces has been recommended for this problem, it is not likely to be helpful. The foot will be less stable and likely have greater tendency for an increase in eversion forces on softer surfaces, such as grass or sand. Packed dirt would be an ideal surface. I specifically advise against running on

concrete. Shoes with improved stability features should also be recommended. Posterior stretching exercises are important. I also recommend strengthening the invertor muscles including the posterior tibial muscle. The wobble board seems to be an improvement over theraband exercises since the wobble board provides a dynamic exercise and improves muscle strength, balance,

and joint proprioception. An orthotic is useful to control eversion forces and decrease supination resistance.

**Patello-Femoral Dysfunction/Peri-Patellar Pain Syndrome**

Patello-femoral pain has long been a common running problem, but has troubled fewer runners lately. Hip and gluteal weakness is often found in conjunction with the knee pain. Assess the biomechanics of your patient, including limb length and abductor muscle strength. My usual recommendations include prescribing a decrease in training, avoidance of downhill running, a return to running with run/walk intervals (Figure 7), straight leg lifts (10 sets of 10 repetitions), bridges to strengthen the gluteal muscles, other gluteal isolating exercises, and, if needed, a stability shoe, and possibly orthotics. **PM**

**References**

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**Web Resources**

AAPSM <http://www.aapsm.org/>  
 Dr. Pribut's Running Injuries Site <http://www.drpribut.com/sports/sport-frame.html>

**FIGURE 7:  
Return to Running Schedule  
(after injury with four-week layoff)**

Week	Walk/Run Schedule
1	Walk 10-20 min. every other day
2	Walk 20-40 min. 5 days per week
3	Jog at easy pace 10 min. + 20 min. walk
4	Jog 15 min. + 20-30 min. walk
5	Alternate for 4-5 Days of week: Run 15 min. / Run 25 min.
6	Alternate 20 min./30 min. runs
7	Alternate 20 min./30-35 min. runs
8	Alternate 25 min./30-40 min. runs

**FIGURE 8:  
Pribut Pain Staging  
of Overuse Injuries in Athletes**

**Stage 0:** No pain is present before, during or after activity. Minor discomfort may be experienced at various times during training or racing.

**Stage 1:** Pain or stiffness after activity. The pain is usually gone by the next day.

**Stage 2:** Mild discomfort before activity that goes away soon after exercise is commenced. No pain is present in the latter part of the exercise. Pain returns after the exercise is completed (starting within 1 to 12 hours later and lasts up to 24 hours).

**Stage 3:** Moderate pain is present before sport. Pain is present during sport activity, but is somewhat decreased. The pain is an annoyance which may alter the manner in which the sport is performed.

**Stage 4:** Significant pain before, during, and after activity. The pain may disappear after several weeks of rest.

**Stage 5:** Pain before, during, and after activity. The athlete has stopped his/her sports participation because of the severity of the pain. The pain does not abate completely even after weeks of inactivity.



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