

Chapter 4

The Foot and Lower Leg

This chapter will deal with the common athletic injuries and conditions of the foot and lower leg, excluding the ankle. The ankle joint will be discussed in the next chapter.

Anatomy

The Lower Leg

The two bones of the lower leg are the tibia and the smaller fibula. These bones will be further discussed in the ankle and knee chapters.

The area on the front of the lower leg is called the shin. Often associated with shin pain is the interosseous membrane, which connects the tibia and fibula.

There is no large muscle mass on the front of the leg, and the blood supply to it is poor.

The most prominent features on the back of the lower leg are the calf muscles (gastrocnemius and soleus) and the Achilles tendon. Often called the heel cord, the Achilles tendon of the calf muscles attaches to the calcaneus, or heel bone.

The Foot

The foot is the site of some of the most minor, yet irritating conditions suffered by athletes. Examples of these conditions include blisters, calluses, athlete's foot and ingrown toenails. Left untreated, though, these conditions can be just as disabling for an athlete as some of the more serious foot problems, such as heel bruises, arch strains and fractures.

The foot has stresses placed on it that exceed the demands placed on any other area of the body.

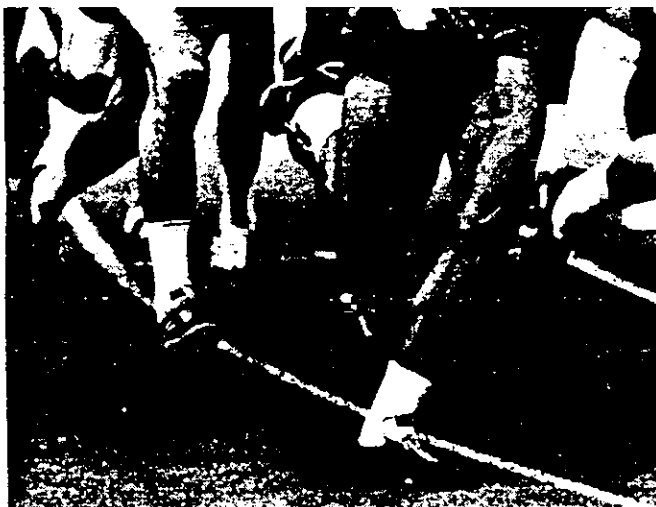
This area stabilizes and supports the rest of the body while standing, walking, running or jumping. Whether the impact with the ground is on the heel (as in jogging), the ball of the foot (as in running) or the toes (as in sprinting) the foot responds by absorbing several hundred pounds of force — up to three times the body weight.

Individually, the parts of the foot (bones, muscles, ligaments) are relatively weak. As a whole, however, the foot is strong enough to withstand most of the demands of athletics.

The key to the foot's function is a set of four arches, which help in absorbing the impact of walking, running and jumping. The arches are called:

- 1) Transverse arch
- 2) Metatarsal arch
- 3) Inner longitudinal arch
- 4) Outer longitudinal arch

The feet contain about one-fourth of the total number of bones in the body. Each foot has 26 bones (7 tarsal bones, 5 metatarsal and 14 phalanges) and 38 joints.



The tarsal bones are the talus, calcaneus, navicular, cuboid, and the medial, intermediate and lateral cuneiform bones. (The talus and calcaneus will be discussed more in the next chapter.)

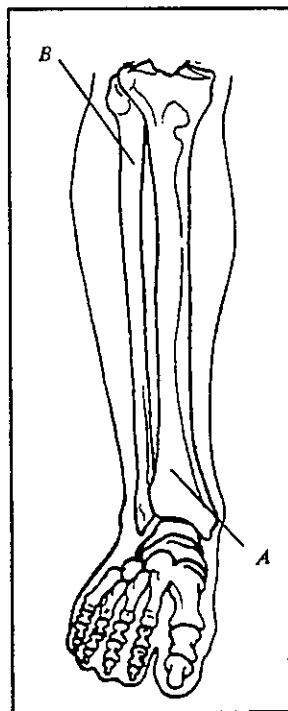
Injuries to the Lower Leg

Shin Splints

The term *shin splints* has inaccurately become a catch-all term to describe pain or injury of the anterior portion of the lower leg. However, for the student athletic trainer to assume that any lower leg pain in athletics is a symptom of shin splints would be a mistake. Two other much more serious injuries often have similar symptoms to shin splints. These injuries, discussed later in this chapter, are stress fractures and anterior compartment syndrome.

By determining the mechanism of injury, the athletic trainer can treat the specific injury.

The shin splint injury is thought by many to be an inflammation of the interosseous membrane. Because of



The bones of the lower leg are the tibia (A) and the fibula (B). Both of these bones are susceptible to stress fractures, often dismissed as shin splints. Proper diagnosis and treatment are essential, as continued stress will lead to a worsening of the fracture.

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the lower leg's poor blood supply, any injury in this region can be slow to heal. Left untreated and uncorrected, the condition can worsen until it is disabling.

Some causes of shin splints are: suddenly increasing the level of conditioning; muscle weakness or imbalance; lack of proper conditioning; improper or incomplete warmup; poor flexibility or lack of stretching; running on hard surfaces; improper running form or habits; improper or worn running shoes; or poor foot structure.

Besides addressing any of the possible causes listed above, there are other specific measures the trainer can recommend to prevent or treat shin splints.

1) Because shin splints is an inflammation, cold is the most effective treatment after exercise. Applying cold before exercise has also been effective.

2) Stretching the muscles of the back, hip and legs can help prevent injuries, including shin splints.

The two calf muscles on the back of the leg, the gastrocnemius and soleus, are often neglected when it comes to flexibility. To stretch the gastrocnemius muscles, the athlete should stand slightly more than arm's length from the wall with feet at shoulder width. The feet should be pointed in slightly. Keeping the feet flat on the floor, the knees locked and the back straight, the athlete

Vocabulary

achilles tendon — tendon attaching the calf muscles to the heel

anterior compartment syndrome — hemorrhage and swelling within one of the compartments of the lower leg; results from direct trauma or excessive activity

antibiotic — substance that inhibits or destroys the growth of organisms that cause infection, such as bacteria or fungi

arch sprain — injury in which ligaments of any or all of the four arches in the foot are stretched or torn

athlete's foot — fungus infection on the foot, characterized by redness, itching, scaling and sometimes blisters

blister — injury that occurs when friction causes layers of skin to rub together and separate, resulting in fluid formation within the area of separation

calcaneus — large bone in the foot that forms the projection of the heel

calf muscles — muscles in the back of the lower leg; the soleus and the gastrocnemius

callus — thickening in the top layer of skin, often developing where bones exert pressure on the skin

cuboid — the outer bone of the foot

cuneiforms — three bones in the tarsus (group of foot bones); medial, lateral and intermediate

donut pad — felt pad with hole cut in it to be placed over a point of tenderness, such as a blister or bruise

dorsiflexion — ankle movement bringing the foot toward the shin

eversion — turning the sole of the foot outward

fibula — long, thin outer bone of the lower leg

gastrocnemius — larger of the two calf muscles

germicide — agent that destroys germs, promotes healing, prevents infection

heel bruise — injury to the fat pad of the heel

heel spur — bony growth on the calcaneus, causing painful inflammation

hot spot — warm, tender area that often develops in advance of a blister

inflammation — body tissue's reaction to injury;

involves redness, swelling, heat, pain, loss of function
interosseous membrane — tissue connecting the tibia and fibula

inversion — turning the sole of the foot inward

longitudinal arches — two arches that follow the length of the foot; inner and outer

mechanism of injury — how an injury happens; cause of injury

metatarsal arch — an arch in the foot formed by the metatarsal heads

metatarsals — bones of the foot

muscle cramp — sudden, violent contraction of a muscle

navicular — boat-shaped bone in the foot

phalanges — the bones of the fingers and toes

plantar fasciitis — strain of the wide, inelastic connective tissue that supports the arch of the foot

plantar flexion — ankle movement pointing the foot downward

range of motion — movement of a joint around a central point

shin splints — often misused term referring to pain in the anterior portion of the lower leg; often thought to be inflammation of the interosseous membrane

soleus — broad, flat muscle in the calf, deeper and smaller than the gastrocnemius

stress fracture — bone fracture caused by severe exercise or overuse; sometimes mistaken for shin splints

talus — one of the bones of the tarsus

tarsals — bones that form the foot

tarsus — group of seven bones that form the proximal part of the foot

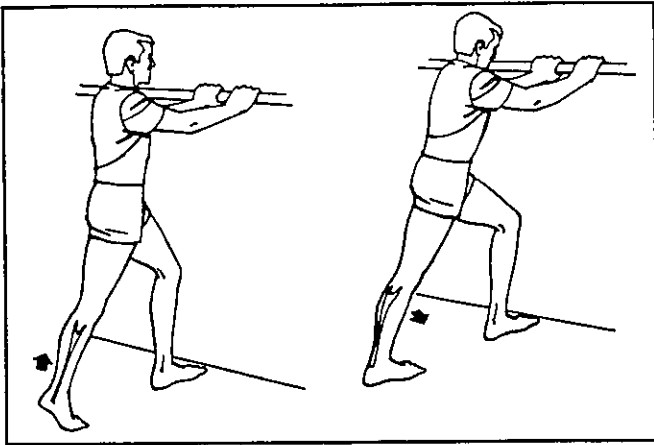
Thompson test — used to detect achilles tendon rupture; checks the reaction of calf muscles when squeezed

tibia — the shin bone; inner and larger bone of the lower leg

transverse arch — an arch of the foot that extends across the tarsals

turf toe — a sprain of the ligaments supporting the big toe

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Stretching the calf muscles can help prevent lower-leg injuries.

leans toward the wall. Finding a position of leg tightness in the upper calf, the stretch is held for seven seconds, then repeated. As the muscles loosen, the athlete will be able to gradually increase the stretch. This exercise should be repeated 10 times before every workout.

To stretch the soleus muscles, the above procedure is used, except that the knee is bent; the stretch will be felt in the lower calf.

3) There are numerous exercises that one can do to strengthen the muscles of the lower leg. Concentration should be on strengthening the muscles of inversion, eversion, plantar flexion and dorsiflexion. You can give manual resistance to these movements by taking the athlete's foot and resisting the movement as an attempt is made to perform all the ranges of motion.

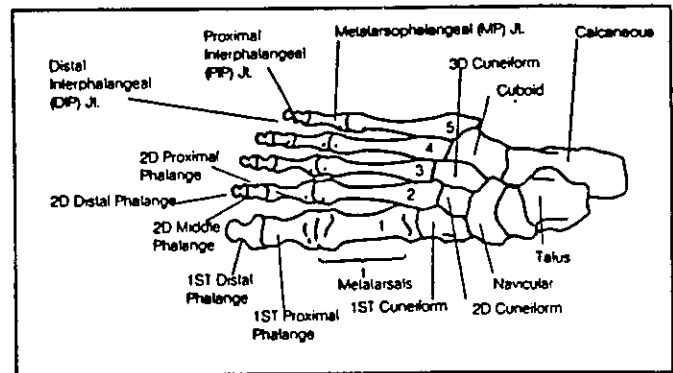
Also, the athlete can pick up objects (marbles) with the toes to help strengthen the muscles. Another successful exercise involves a towel and using the toes to bring the towel under the foot and back out again. The athlete sits on a chair on a tile floor, and an unfolded towel is laid out in front of the chair. The foot is placed on the towel and the toes repeatedly flex to bring the towel under the foot. When the bulk of the towel is under the foot, then the toes repeatedly extend to push the towel back out.

The heel should remain in place throughout the exercise and a weight (such as a book) can be placed on the end of the towel when the exercise begins to get easy due to the athlete's increased strength. This exercise should be repeated 25 times.

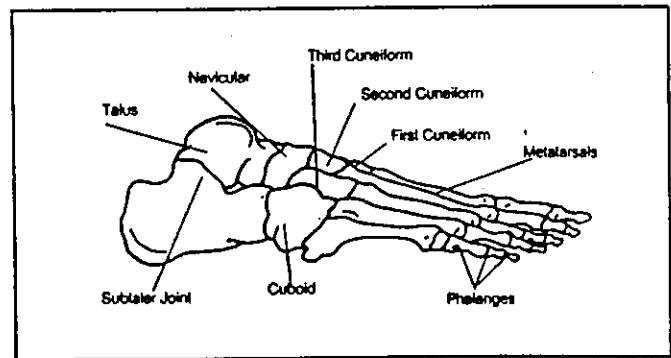
4) There are two different tapings that the trainer can try to help relieve some of the pain of shin splints. One taping involves taping the longitudinal arch (see taping procedure in this chapter). This taping will give support under the longitudinal and transverse arch. These arches will then be able to absorb the shock of the activity and therefore lessen the trauma to the lower leg.

Another taping utilizes pressure and lift to help relieve pain. The lift and pressure should be applied over the sorest point. The taping will begin below this sore area and spiral around the leg. A 3" elastic wrap compresses the entire taping.

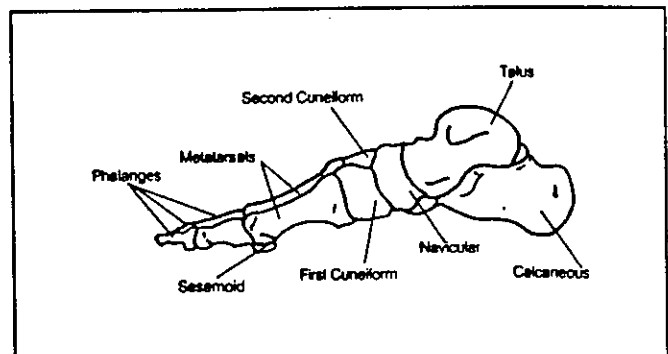
5) When the athlete is well on the way to recovery, you may want to try using a form of heat on the leg. Your coach may suggest using a warm whirlpool (102°F)



The bones of the foot: top view.



The bones of the foot: lateral view.



The bones of the foot: medial view.

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for a 20 minute treatment. An analgesic pack can also help reduce shin splint pain in some cases. Apply a light coat of a mild strength analgesic over the entire shin area. Cover with a piece of Cramerol® plastic-backed compress roll and apply a 3" elastic wrap to hold it in place and to provide compression for comfort.

6) Rest is a form of "treatment" that no athlete likes to hear. An athlete who is not experiencing results from the treatments already mentioned may need to rest in order to find relief. The athlete who is in severe pain and constant soreness needs to be under a physician's care.

Stress Fractures

Bones are not inanimate objects. They are living tissue. Just like muscle cells, bone cells respond to exercise, growing stronger to meet new demands. Lack of exercise can lead to deterioration, or deossification of the bone.

If the exercise is too severe, or of too long a duration, the change in the bone structure will be negative; a *stress fracture* can begin to develop. Continued stress will lead to a worsening of the fracture.

Because stress fractures often occur in the lower leg, there is a tendency to dismiss pain in this area as mere shin splints. Early X-rays of the shin may not reveal evidence of the stress fracture.

Signs of a stress fracture might be increased pain every time the athlete exercises.

Point tenderness is also an indicator of an injury more severe than shin splints. Usually, a stress fracture will hurt when the athlete presses with the fingers just above and below the site of most pain.

If a stress fracture is suspected, the student trainer should notify the physician. First aid procedures are cold and elevation.

Anterior Compartment Syndrome

Anterior compartment syndrome is another condition that, when suspected by the coach or student athletic trainer, should be referred immediately to the physician.

The lower leg is made up of four compartments: (1) anterior, (2) lateral, (3) superficial posterior and (4) deep posterior. Most compartment syndromes in athletics are to the anterior compartment.

As with stress fractures, anterior compartment syndrome can be mistaken for shin splints. In addition, anterior compartment syndrome can be misdiagnosed as a contusion of the shin, muscle cramps or spasms.

The danger in misdiagnosis is a worsening of the condition. This could lead to permanent nerve damage, which could result in permanent disability.

The anterior compartment is tightly filled with the muscles that dorsiflex the foot and ankle. It is almost entirely enclosed with rigid walls of bone or tissue.

Direct trauma or excessive exercise can result in hemorrhage and swelling inside the compartment. This swelling will increase the pressure on the peroneal nerve, the veins and finally the arteries inside the compartment. Without-arterial-circulation, muscle-cells-will-die.

Signs of anterior compartment syndrome include pain even after cold treatment, a firmness of the muscle, numbness of the foot and warmth.

Once suspected, anterior compartment syndrome should be treated as a medical emergency. First aid treatment should be cold in the form of an ice bag or cold pack placed on the injury. Unlike most injuries, compression and elevation should not be used, as they could worsen the condition. The pressure of ice massage could also aggravate the injury.

Achilles Tendon Strain

Although the Achilles tendon is the strongest in the body, it is a vulnerable area for athletes; severe damage, such as a tear, can be career-threatening. The tendon is formed by the union of the gastrocnemius and soleus muscles on the back of the leg; the tendon inserts on the calcaneus.

Injuries can be caused by overuse, muscle imbalance, inflexibility or a sudden movement. Depending on the force and the condition of the tendon, the injuries can range from mild strains to complete ruptures.

Strains of this important tendon must be treated more conservatively than most muscle injuries. This is because of the disability the injury produces and the tendency for the strain to develop into a complete tear.

The Achilles tendon is sometimes strained when the ankle is sprained, and may take longer to heal than the injured ligaments. A strong, stable and flexible Achilles tendon can prevent many ankle sprains.

Strains are treated with cold, compression and elevation. Follow-up treatments can include cold, heat or contrast baths.

While the tendon is healing, the athletic trainer can reduce irritation by restricting dorsiflexion of the ankle. This can be done by padding the heels of both feet; elevating only one heel could create a postural imbalance, which could lead to other injuries. The Achilles tendon can also be "shortened" by taping; however, many athletes find this tape job uncomfortable.

Achilles tendon *ruptures* can be partial or complete. In either case, if damage is suspected, the team physician should be notified. Surgery is often required.

A rupture is often caused by a sudden movement, being kicked or gradual deterioration of the tendon through chronic tendinitis. The athlete will complain of pain, such as a feeling of being kicked or shot. There will be swelling and discoloration. The trainer may observe an indentation on the Achilles tendon.

One sign of rupture is a positive Thompson test. The Thompson test checks the reaction of the calf muscles when squeezed. With the foot hanging off the edge of the table, squeezing the calf muscles will create plantar flexion when the Achilles tendon is intact; lack of plantar flexion is a sign of ruptured tendon.

The chance of Achilles tendon injury can be reduced by stretching the area daily, strengthening the muscles of

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the leg, and wearing low-heeled shoes.

Muscle Cramps

In athletics, we often see an athlete make a rapid recovery from what appears to be a painful, disabling knee or ankle injury. In those cases, the injury may simply be a cramp in the calf muscles. (Other muscles can also cramp involuntarily, but the calf muscles are especially susceptible.)

A cramp is a sudden, violent contraction of a muscle. While the cause is unknown, several factors seem to contribute to their incidence:

- 1) Overwork in early season.
- 2) Fatigue.
- 3) Loss of fluid from perspiration.
- 4) Poor foot structure, which causes tension and strain on muscles and tendons.
- 5) Lack of proper nutrients in the diet.
- 6) Incomplete rehabilitation of a previous injury.
- 7) Improperly fitted equipment or shoes that retard circulation, preventing complete relaxation of the muscles.



8) Imbalance in the lumbar area of the low back, aggravated by improper strain.

9) Poor flexibility.

If a particular athlete suffers from repeated muscle cramps, the student trainer can usually trace the cause to one of the above factors.

To treat a leg cramp, the muscle should be placed on stretch. To stretch the gastrocnemius, the athlete should sit with the leg straight; the student trainer then should gently press the foot toward the shin. If this method fails to relieve the pain, the athlete needs to stretch the soleus muscle. To do this, the athlete stands with the leg bent and heel flat on the floor; then, the foot is gently raised toward the shin.

Some recommend massaging the calf to relieve the spasm, while others contend that massage will increase the pain. The student trainer should discuss this and all treatments with the team physician.

Injuries to the Feet

Blisters

Although *blisters* can occur on any part of the body where friction occurs, in athletics they are most often found on the feet. As the layers of the skin rub together, friction causes separation. The body responds with fluid formation in this separation. This fluid creates pressure on nerve endings, which is perceived as pain. If the blister is neglected, it may break, creating an open wound.

Once formed, blisters cannot be ignored. Proper treatment of a blister is mandatory in order to insure maximum comfort of the athlete and reduce the possibility of infection. A conservative approach in treating a closed blister involves the following steps:

Blisters can be very painful, and even debilitating, if not properly treated. The application of a "donut" pad can help take pressure off of a blister.



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- 1) Clean the area thoroughly with soap.
- 2) Apply an adherent to the area surrounding the blister.
- 3) Take a felt pad and cut a hole in it, the size of the blister. This is a "donut," which will take pressure off of the blister.
- 4) Place the donut over the blister so that the sore part of the blister is exposed through the hole.
- 5) Use a tongue depressor or cotton-tipped applicator and place an antibiotic ointment on the surface of the blister.
- 6) Cover the area with a sterile gauze pad, tape underwrap, and tape.

If the blister has opened, it must be treated as an open wound:

- 1) Clean and disinfect sharp-pointed medical scissors thoroughly and trim off all loose skin.
- 2) Clean the area thoroughly with soap.
- 3) Apply a germicide to the area.
- 4) Apply an adherent to the area surrounding the blister. Use a cotton-tipped applicator so that adherent does not get in the wound.
- 5) Make a donut out of felt.
- 6) Place the donut over the blister so that the sore part of the blister is exposed through the hole.
- 7) Use a cotton-tipped applicator and place an antibiotic ointment on the wound.
- 8) Cover the area with a sterile gauze pad, tape underwrap, and tape.

A very tender, open blister requires special care in order to prevent infection:

- 1) Clean the area thoroughly with soap.
- 2) Apply a germicide or germicide compress:
 - a) Cover the wound area with a sterile gauze pad and wet it thoroughly if using a liquid germicide.
 - b) Keep the gauze wet for 20 minutes. Apply more germicide if necessary.
 - c) Remove the germicide compress and complete the procedures required in the use of an adherent, donut and antibiotic ointment before covering.

What can be done to prevent these blisters? We can partially eliminate this problem by: (1) wearing properly fitting shoes and shoes that are suitable for the activity, (2) breaking in new shoes gradually, (3) applying a tape adherent to "toughen" the skin, (4) using powder and a skin lubricant to cut down friction, (5) wearing two pair of socks; turn the first pair inside out so the soft side of the sock is next to the skin, (6) applying protective padding where necessary, (7) removing excessive callus formation. These measures will become habit-forming for everyone on the team if the supplies are readily available to them. Have a small utility area in the locker room to keep these supplies.

There is an eighth method of blister prevention which calls for the fullest cooperation of the coach as well as the players. Nearly always, a "hot spot" develops in

advance of the blister itself and should be taken as a warning sign. This "hot spot" will feel tender and warm from the friction that is producing it. If the friction is eliminated immediately with use of a skin lubricant and possibly a protective pad, the blister can be prevented. It is important to understand that the word "immediately" in this case can mean right in the middle of practice, as soon as the athlete begins to feel the discomfort of the "hot spot." If the application of the lubricant is delayed until after practice, the blister, no doubt, will have already formed.

This means that you must have in your kit, on the practice field, the items you will need to make these donut pads in a hurry. It is also understood that the coach will stop play long enough, or substitute another player, so you can make the application. The athletes need to be instructed that it is their responsibility to bring these "hot spots" to the attention of the coach and trainer the second they feel them.

We briefly mentioned that excessive callus formation contributes to the formation of blisters. The callus becomes a source of friction and creates a blister that is very deep, under the callus. This is quite painful and poses a serious threat of becoming infected.

Constant turning and twisting, as in basketball, makes this blister-callus combination a problem during the season. A callus file, nail file, emery board or fine sand paper should be used regularly to keep the callus from becoming too thick. Players with this problem should be checked regularly and special emphasis needs to be made on the fit of the shoe.

Arch Sprains

Most people are unaware that there are four arches in the foot. Each contributes to balance, movement, support and shock absorption. To help understand these arches, place a wet foot down on an absorbent paper towel and observe the footprint.

Any of the four arches of the foot (transverse, metatarsal, inner or outer longitudinal) can suffer supportive ligament sprains. Once the ligaments are stretched, they fail to hold the bones of the foot in proper position.

When an arch is weakened in this manner, it can't absorb shock as well as it's designed to do. Resulting manifestations the student trainer might see include: shin splints, Achilles tendon strain, foot fatigue, strained muscles and even blisters.

If the student trainer treats only the symptoms, the arch sprain may worsen.

Causes of arch problems include overuse, overweight, fatigue, training on hard surfaces and wearing non-supportive, worn shoes.

First aid, as with other ligament sprains, includes cold, compression and elevation. Most arch sprains are to the metatarsal arch (at the distal end of the metatarsals) or inner longitudinal arch. Sample tapings are illustrated.

Heel Bruise

The heel receives, absorbs and transfers much of the impact from sports activities, especially running and jumping. Therefore, the ligaments, tendons and fat pad of the heel are all subject to stress and injury.

Along with the hip pointer, the *heel bruise* is among the most disabling contusions in athletics. The protective fat pad must be rested or protected during athletic activity to allow healing to occur. Cold application before activity, and cold and elevation afterwards can help reduce swelling and pain.

The athletic trainer can also supply the athlete with heel cups to help absorb the force of the heel's impact with the ground or floor. Or, a donut pad can be constructed to protect the bruised area. To prevent



Applying a metatarsal arch pad cushions the sprained arch, helping to relieve pain.

muscle imbalance and problems from misalignment of the body, both shoes, not just the shoe of the injured foot, should contain equal amounts of padding.

Plantar Fasciitis

The *plantar fascia* is a wide, inelastic ligamentous tissue that extends from the anterior portion of the calcaneus to the heads of the metatarsals. It supplies support to the arch of the foot.

This tissue can become strained from overuse, unsupportive footwear, a tight achilles tendon or running on hard surfaces; most often, the cause of plantar fasciitis is chronic irritation. Cross-country and track athletes are prone to overuse injuries in which the plantar fascia is continually strained from running and jumping. Basketball and volleyball athletes are also susceptible to plantar fasciitis from repeated jumping and landing.

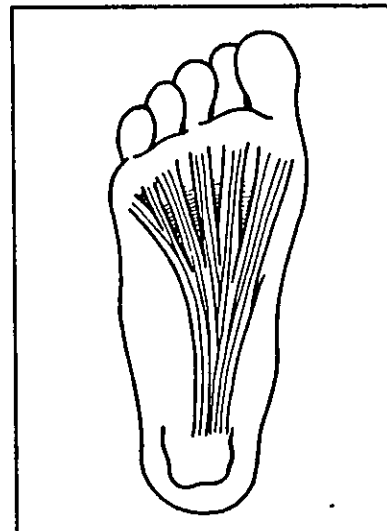
An athlete with plantar fasciitis will experience pain and tenderness on the bottom of the foot near the heel. Untreated, this condition causes body imbalance which can lead to heel spurs, muscle strains, shin splints and other problems.

Besides treating with cold, the trainer must evaluate and correct the cause of the problem. Taping can help provide support and stability.

Heel Spur

A *heel spur* is a bony growth on the calcaneus that causes painful inflammation of the accompanying soft tissue and is aggravated by exercise. The student trainer can locate a heel spur by pressing on the heel.

This condition is often caused by "flat feet." As the foot flattens, the plantar fascia is stretched and pulled at



The plantar fascia is a wide band of inelastic tissue that is especially susceptible to injury from overuse or repeated jumping and landing.

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the point where it attaches to the calcaneus. Over a period of time, the calcaneus reacts to this irritation by forming a spur of bony material.

The team physician may recommend taping the arch or the use of shoe inserts (orthoses) to help reduce the plantar fascia's pull on the calcaneus.

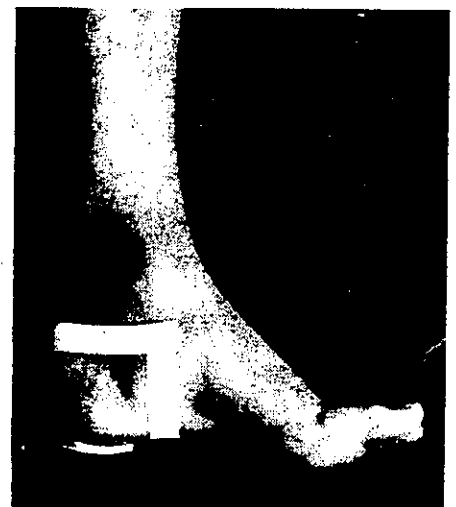
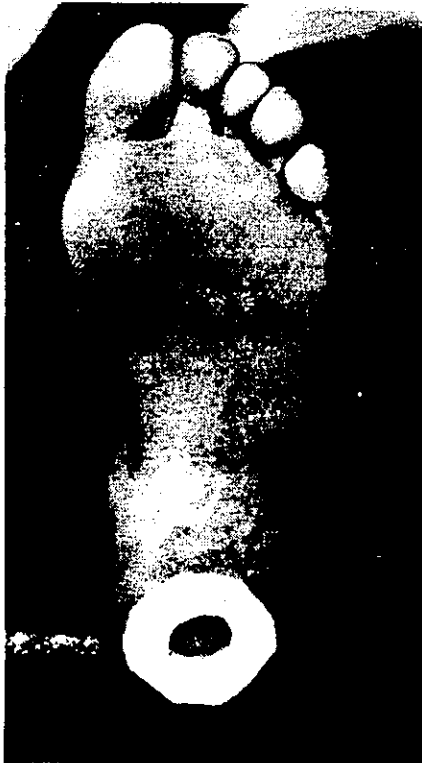
Turf Toe

The big toe is very important in balance, movement and speed. Occasionally, the ligaments supporting the toe will become sprained, severely limiting the athlete's

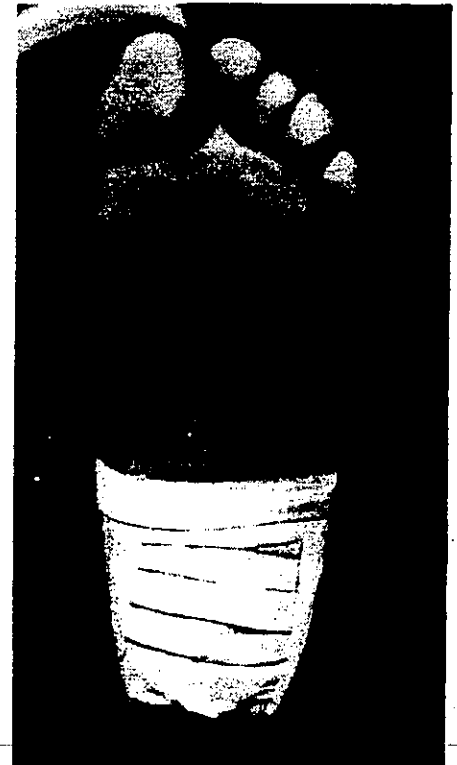
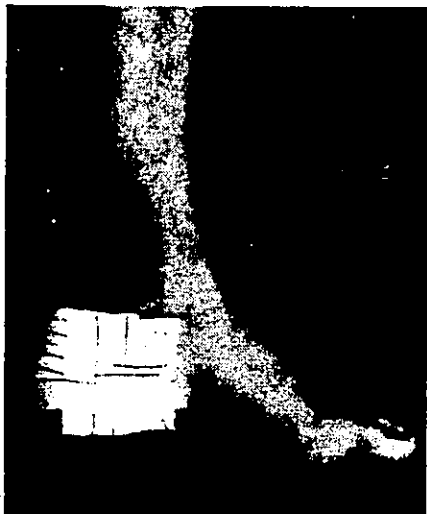
performance. *Turf toe* is the name given to such a sprain. Often, the mechanism of the injury will be the foot sliding back on a slippery surface, which forcefully hyperextends the toe.

As with any acute sprain, immediate care of turf toe is application of cold and elevation. The physician may take X-rays to rule out a more severe injury.

Most sprains of the big toe are minor. Once normal function returns, the athletic trainer should support the toe to prevent another sprain. A sample taping procedure is pictured.



The heel bruise is a very painful injury that requires rest and protection to heal. A donut pad can be applied, as shown here, to help protect the bruised area.



Other Foot Problems

Ingrown Toenails. Usually occurring on the big toe, an ingrown toenail is extremely painful and disabling. It occurs when a section of the toenail grows into the soft skin of the foot.

The team physician may recommend soaking the foot two or three times a day in warm water and an antiseptic. Antiseptics may be prescribed to control infection. Left untreated, surgery may then become the only remedy.

Ingrown toenails can be prevented by correct, straight-across trimming of the nails. Tight, pointed shoes can also cause this problem.

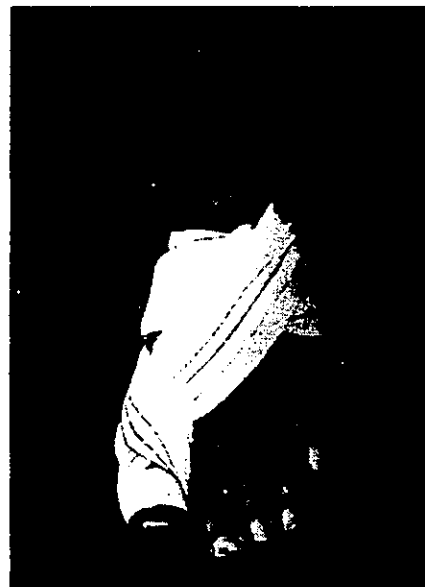
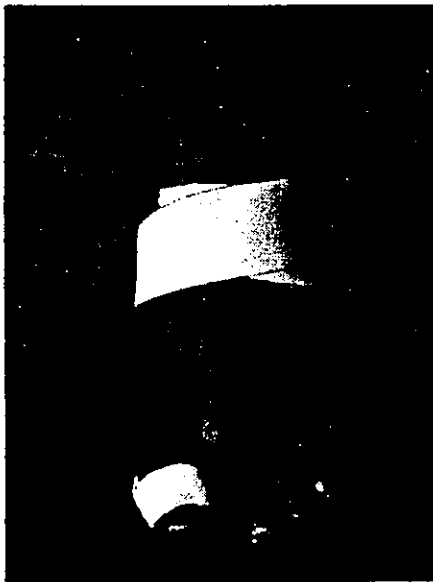
Corns and Calluses. Sometimes aggravated by tight, ill-fitting shoes, these conditions often develop where bones exert pressure on the skin.

This pressure and friction result in a thickening of the top layer of skin. This thickened skin can be painful, and can even lead to a disabling bony growth in the foot.

Regular use of a nail file and skin lubricants, as well as wearing socks and properly fitted shoes, can help prevent these problems.

Plantar Warts. These are hard, callused areas on the bottom, or plantar side, of the feet or toes. While corns and calluses are often caused by pressure, warts are

A sample taping method for turf toe.



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A sample taping method to support the longitudinal arch.



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caused by a virus and, therefore, can spread to other members of the team.

A plantar wart is characterized by a lumpy, callused area with a black dot in the center. The student trainer's responsibility is to alert the team physician to this problem's existence so medical treatment can be given.

Athlete's Foot. One of the most common minor conditions in athletics, athlete's foot can hinder the athlete's performance if left untreated.

Athlete's foot (also known as tinea pedis) is caused by a fungus and is characterized by redness, itching, scaling and sometimes formation of fluid-filled blisters.

Appropriate treatment of athlete's foot consists of

good foot hygiene and proper medication. If the condition worsens or is left untreated, the cracked skin could serve as an avenue for a secondary infection.

Susceptibility to athlete's foot will vary among team members but can be lessened with good foot hygiene. Athletes should wash and dry their feet thoroughly, especially between the toes, and change socks daily, using a fresh pair for each practice. Daily application of a medicated foot powder to the feet and shoes is a proven method of keeping athlete's foot out of the locker room. The custodial staff should also be alerted to disinfect locker room areas regularly.



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Review Questions — Part One

1. Two indicators of stress fractures are _____ and _____.
2. Of the two major bones of the lower leg, the _____ is larger than the _____.
3. Connecting the two major lower-leg bones is the _____ membrane. When this membrane is inflamed, the injury is known as shin _____.
4. The two most prominent features on the back of the leg are the calf muscles (the _____ and the _____) and the _____ tendon, also known as the heel cord.
5. The calf muscles converge to form the _____ tendon, which attaches to the _____.
6. The largest bones of the feet are the seven _____.
7. The Achilles tendon attaches to the largest tarsal bone, the _____.
8. The term shin splints is often used to describe pain of the _____ portion of the lower leg.
9. Other conditions that have similar symptoms to shin splints are _____ and _____.
10. Because shin splints is an inflammation, _____ is the most effective treatment after exercise.
11. Unlike with most injuries, compression and elevation should not be used when _____ is suspected.
12. The strongest tendon in the body is the _____ tendon.
13. The Thompson test is used to determine if the _____ is ruptured.
14. Often, a _____ develops in advance of a blister.
15. Each of the four arches of the foot contributes to balance, movement, support and _____.

Review Questions — Part Two

1. Name the four arches of the foot.

- | | |
|----|----|
| 1. | 3. |
| 2. | 4. |

2. What are some of the causes of shin splints? (Name at least four.)

- 1.
- 2.
- 3.
- 4.

3. What are the symptoms of anterior compartment syndrome?

4. Why should anterior compartment syndrome be treated as a medical emergency?

5. What are the possible causes of an Achilles tendon strain?

6. What causes blisters?

7. What are some causes of chronic arch problems?

8. Describe how to stretch the soleus and gastrocnemius muscles. What injuries can this stretching help prevent?

9. Describe how an analgesic pack can help relieve minor shin splint pain.

10. Define the terms anterior, posterior, lateral, medial, distal and proximal.

11. Define the terms plantar flexion and dorsiflexion.

12. List at least six possible causes of muscle cramps.

13. Pain is caused by pressure on nerve endings. Name two causes of this increased pressure.

14. Why are injuries to the lower leg slow to heal?