THE SAN DIEGO KNEE CLINIC

Common Foot Injuries in Sports

We will be offering counseling on diet and exercise. If interested, please contact my office and schedule a medically supervised *Health and Orthopedic Fitness* assessment appointment which will include a spine and joint health assessment evaluation. This assessment will not be covered by health insurance.

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A physician dealing with athletic injuries of the foot will see fractures and strains as a result of mechanical, congenital, or functional disorders of the foot, compounded by training errors or overuse. The physician can help prevent the reoccurrence of these problems by adopting a knowledgeable and systematic approach to examination, diagnosis, and treatment.

The foot is wonderfully complex. It is the base of support when we are standing, walking, and running, and it is the mechanism that transfers the mechanical power of the legs to the ground for locomotion. The foot can be rigid when transferring lower-limb power to the ground, and it can be flexible when responding to changing surface characteristics. This versatility is necessary for athletes because the surface they play on may be soft or hard, slippery or sticky, smooth or rough. The foot must meet the demands placed on it by sudden stops and starts, jumping or high-impact loads, and sustained and repetitive loads. It must also adapt to being encased in a rigid ski boot or going barefoot.

Because of the foot’s complexity, anyone dealing with foot problems must have an intimate understanding of both its anatomy and its biomechanics.

The bones of the foot can function individually or as a unit, allowing the foot a great range of motion and versatility.

The foot is composed of 26 bones (Figures 1, 2, and 3). For purposes of analysis, the foot can be divided into three segments: the rear foot, made up of the talus and calcaneus; the midfoot, made up of the navicular bone, the cuboid bone, and the cuneiforms; and the forefoot, made up of the metatarsals and the toes (Figure 3). The motion of the joints in the foot is complex: at times the bones of the foot function as a single unit, and at other times they function individually or as several separate units. That the foot is indeed versatile can be demonstrated by individuals who, having lost the use of their arms, are able to eat, dress, and even write using only their feet.

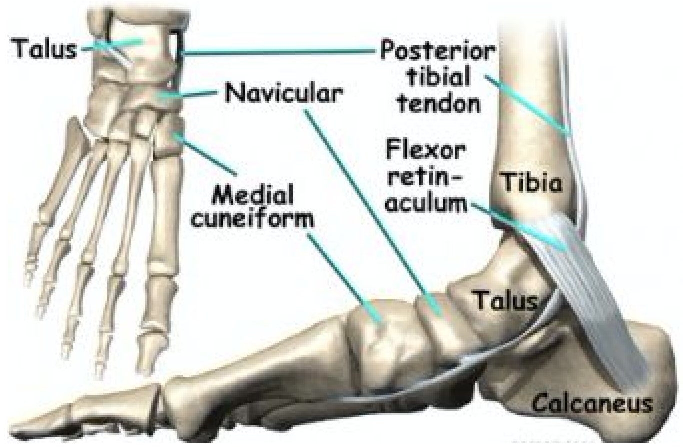


Figure 1. Medial view of the foot showing the bony structure and the arch

The subtalar joint separates the talus and calcaneus (Figure 1). In combination with the ankle mortise, it allows the foot's wide range of motion. Plantar flexion and dorsi-flexion occur at the ankle joint; rear foot pronation and supination occur at the subtalar joint. On average, the subtalar joint can be supinated 20 degrees and pronated five degrees. The ankle mortise and subtalar joint together form a hinge-type "universal" joint whose average functional range of motion is about six degrees. The extrinsic muscles of the lower leg and the intrinsic muscles of the foot stabilize the subtalar joint.

The transitional area between the rear foot and the middle foot is defined by the transverse tarsal, or Chopart's, joint. This joint is responsible for motion between the talus and the navicular bones, and between the calcaneus and the cuboid bones (Figures 1–3). Its motion is closely associated with that in the subtler joint. The primary function of the transverse tarsal joint is to provide both internal and external rotation of the midfoot and the forefoot, further enabling the foot to adapt to varied terrain. Flexion and extension also occur in this joint, but in an unusual manner. When the midfoot and the forefoot are pronated, flexion and extension can occur quite easily in relation to the rear foot. However, when the heel is inverted (arch elevated or foot supinated), flexion and extension become severely restricted. This action enables the foot to become a rigid lever at toe-off in running. This difference probably explains why a pronated foot is better tolerated than a supinated one, or a clubfoot.

The middle foot (Figure 3)—the cuboid bones, navicular bone, and three cuneiform bones—also makes up the longitudinal arch. The motion of joints in this complex is restricted by the shape of the bones, the ligaments, and the contraction of the intrinsic and extrinsic muscles of the foot.

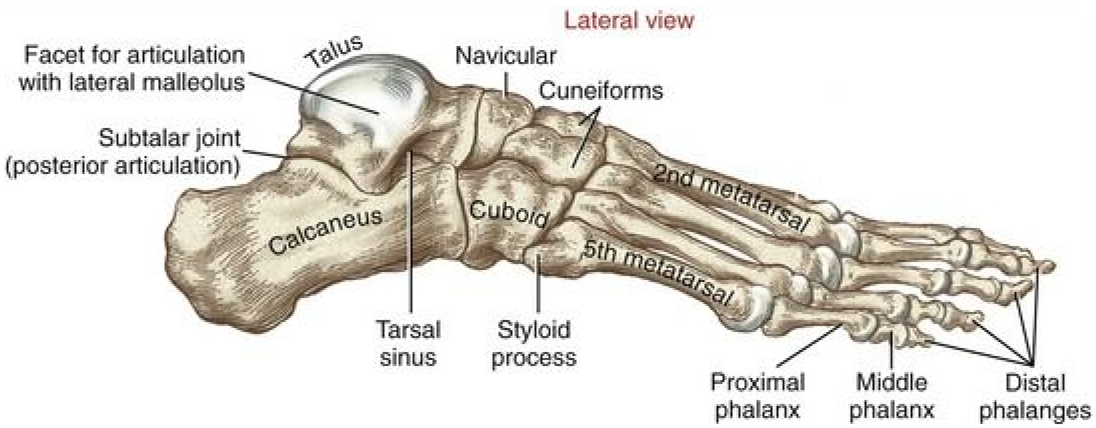


Figure 2. A lateral view of the foot showing the bony structure and the forefoot, midfoot, and rearfoot segments

Total motion of any two bones in this complex is small and, for all practical purposes, is considered to be translation, or parallel, motion of one bone upon another. Total motion of the entire midfoot, on the other hand, ranges from only a few degrees of dorsiflexion to about 15 degrees of plantar flexion. The shape of the longitudinal arch is determined to some extent by this range of total motion and by the other factors influencing motion in the midfoot.

The metatarsophalangeal joints are responsible for most of the motion of the forefoot and enable the metatarsals to adapt to uneven surfaces.

The transitional area between the midfoot and the forefoot is defined by the metatarsal joints (Lisfranc joints), whose function also has some influence on the shape of the longitudinal arch. The second tarsometatarsal joint is recessed into the middle cuneiform, restricting the motion of the second metatarsal and making it more stable than the lateral three metatarsals (Rammelt, 2004). This relative rigidity permits greater loads to be transferred through the second metatarsal at toe-off in running or walking.

The first and lateral three tarsometatarsal joints have a greater range of motion. Most of the motion of the forefoot, which occurs in the metatarsophalangeal joints, coincides with movement of the metatarsals. These bones adapt to uneven surfaces. The mechanics of the forefoot can be illustrated by the performance of the metatarsophalangeal joint of the hallux, or big toe. The range of motion of this joint is about 30 degrees of plantar flexion to about 90 degrees of dorsiflexion or extension. The hallux itself must have a great range of motion to accommodate a wide variety of tasks and loading conditions.

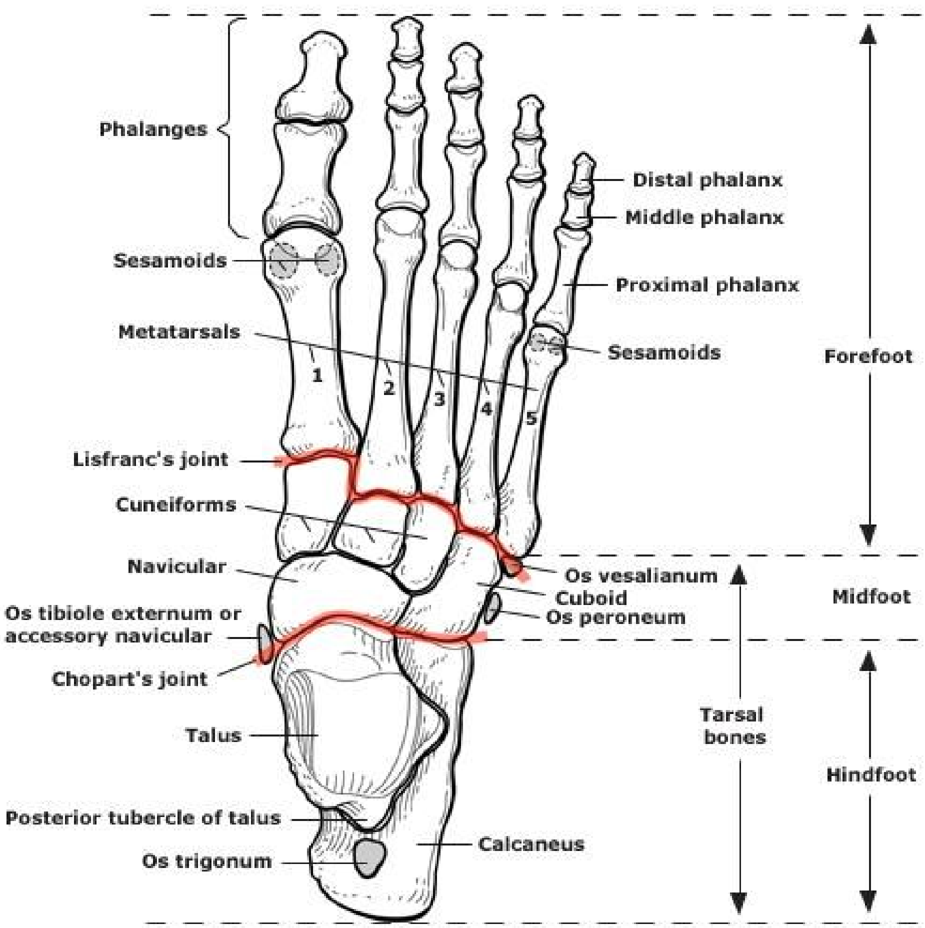


Figure 3. A view of the foot from above showing the bony structure

Movement in the metatarsophalangeal joints is transitional, or sliding-type, which allows the full range of motion. At extreme extension these joints become jammed and compressed. Even when walking, they can reach 90 degrees of extension.

The length of the hallux may be shorter than, equal to, or longer than the second metatarsal. Joint range of motion in the lateral four toes is slightly greater than that of the hallux, ranging from 50 degrees of flexion to 90 degrees of extension. The motion of the toes is controlled by both intrinsic and extrinsic muscles. At toe-off, these muscles relax, allowing the toes to greatly extend at push-off. This increased extension passively stiffens the tarsals (the bones of the rearfoot and midfoot) and metatarsals by means of the plantar mechanism, essentially converting the foot into a rigid lever.

The plantar fascia (Figure 4) originates on the medial tuberosity of the calcaneus and passes forward, spanning all the tarsal and metatarsal joints and attaching at the plantar aspect of the proximal phalanges.

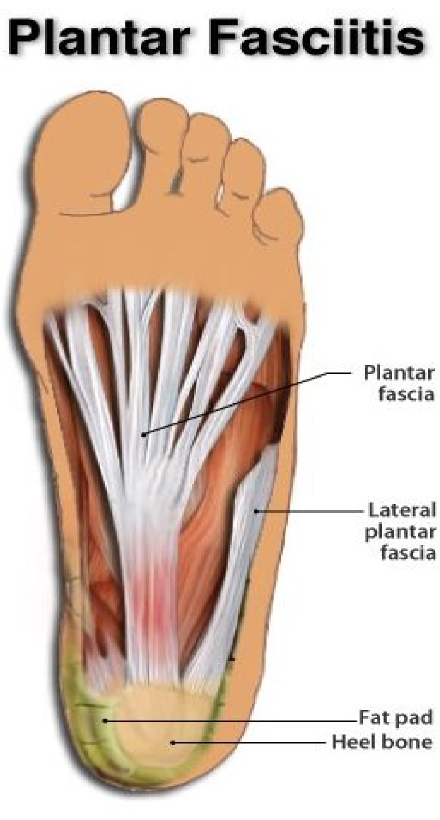
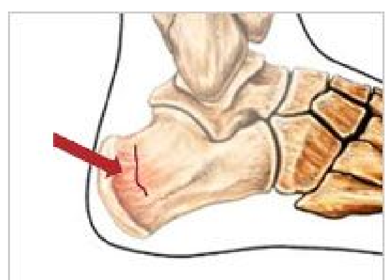


Figure 4 The showing the location of the plantar fascia



The area where a stress fracture may develop in plantar fascitis

Combined with the bones of the foot, the plantar fascia forms a truss-like structure, thus acting as a tether between the calcaneus and the proximal phalanges. The plantar fascia is also partly responsible for maintaining the shape of the longitudinal arch. Although the plantar fascia will elongate slightly under load, this elongation is more a means of shock absorption than a mechanism for providing motion in the foot. Individually, the subtalar, intertarsal, and tarsometatarsal joints have only small ranges of motion because of their irregular, multifaceted shapes, and because they are tightly bound by ligaments collectively. The foot is stiffened by active contraction of the lower leg muscles that insert on the tarsal bones. Contraction of the intrinsic muscles of the foot provides additional stiffness. When all these muscles are contracted, the foot acts as a stiff spring. The tarsal bones are passively locked together by the plantar fascia.

During the stance phase of gait, all the metatarsal heads are in contact with the bearing surface. In normal instance, 50% of the load is borne by the calcaneus, and 50% is transmitted across the heads of the metatarsals. During stance, the head of the first metatarsal bears roughly twice the combined load of the lateral four metatarsal heads. During the latter part of stance, the second metatarsal head begins to accept an increased proportion of the load. It does so because the second metatarsal is usually somewhat longer than the first and is fixed relatively rigidly at its base. Even a slight modification in a foot's structure can drastically alter the way in which load is transmitted through the foot and can result in an injury. Load distribution can also alter as a result of a change in running or walking mechanics, or even a change in type of footwear.

When dealing with a foot problem, a physician must look carefully for derivation of that problem in other parts of the body. A detailed training history is also helpful.

In one respect, the physician is fortunate when dealing with a foot problem: It is one of the few parts of the anatomy whose complete structure is open to examination. But since it is a very complex mechanism, a thorough and systematic approach must be taken when evaluating an athlete’s foot. It is also vital to examine the whole body for any other factors that might be reflected as a foot problem.

An evaluation should always begin with a detailed history. It is usually easiest to have the patient—before seeing the physician—fill out a form that asks pertinent questions. The athlete should describe the problem in detail: When did it begin? What is the site of pain? Does it occur with a particular motion, position, or type of activity? Elicit a detailed training history of the athlete: Has distance, duration, frequency, or intensity of training recently been increased? Has the brand of shoes or the type of training ground recently changed? It is important to know whether the athlete has had any prior back, hip, or knee problems. Examine the athlete’s training and competing shoes for wear pattern, and look for a deformed vamp or heel counter.

The objective examination can begin with an evaluation of the walking gait with and without shoes. It is also desirable to see the foot’s imprint on bearing weight; use a reflex-viewing foot box, sensitized paper, or simply wet the feet. Examine the posture and look especially for scoliosis, lordosis, pelvic tilt, femoral anteversion, knee recurvatum, and tibial torsion. Look at the muscular development of the leg. See if the forefoot is abducted or splayed. Notice whether the athlete has Morton’s foot, hallux valgus, hammer toe, claw foot, or a bunion.

Next, place the athlete on the examination table and test all ranges of motion of the foot and leg. Also check the circulation in both feet. Neurological tests should include Achilles reflex, knee reflex, Babinski’s sign, and other upper-motor neuron toe signs. At the same time, test motor function in the foot and lower limb. Palpate both the bony and soft tissue structures of the foot, being sure to examine the sole of the foot for calluses, blisters, warts, or any deformity. Plain x-rays are mandatory in all foot complaints, and in some cases alternate imaging modalities are required. These x-rays should be taken while the foot is bearing weight in order to see the effect of loading on the internal structures.

Injuries to the midfoot include a Lisfranc joint subluxation or even dislocation occurring between the tarsal bones and the metatarsals. Diagnosis is made with x-rays and CT scan. The x-rays are often not accurate, as the shape of the joint is conical and three dimensional views are often required to define the pathology. Treatment is surgical with displacement of the joints.This condition is often missed. If the original x-rays are felt to be normal, and with a history of significant injury, additional diagnostic studies are indicated to rule out a surgical injury (Tarchynska, 2013).

In most cases, hallux valgus is the result of restrictive footwear. Metatarsalgia is a symptom of a mechanical problem in the foot.

In hallux valgus, which is frequently concomitant with bunion, the great toe deviates medially (Figure 5). This shift leaves a gap between the heads of the first and second metatarsals, and alters the load-bearing characteristics of the forefoot. Over time, the deformity worsens, widening the forefoot and forming a thick-walled bursa and ectopic bone over the prominent medial first metatarsal head. Osteoarthritis of the first metatarsophalangeal joint can develop over time as a consequence of the gross malalignment.

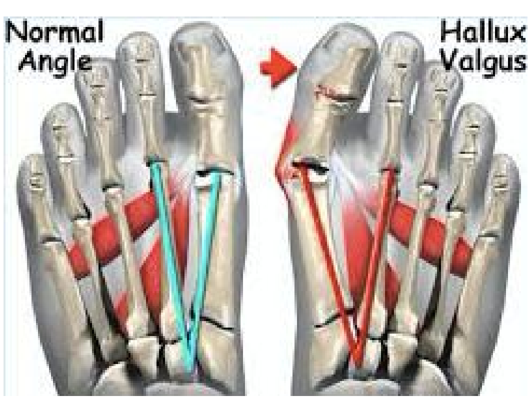


Figure 5. A comparison of a normal great toe and one with hallux valgus deformity

Congenital factors are undoubtedly responsible for hallux valgus in some people. However, in the majority of cases, a bunion develops as a result of restrictive footwear, which forces the great toe laterally. (There is a higher incidence of bunion among women). This problem is particularly common among athletes who wear narrow, restrictive shoes. The initial symptom is tenderness from the pressure of the shoe on the metatarsal head. Later symptoms are the result of osteoarthritis in the joint and the altered load distribution on the forefoot.

Hallux valgus is visible when looking at the foot, although x-rays are essential to determine the status of the joint. The skin over the joint will be reddened, hard, and tender, and the athlete may also complain of medial knee pain because the altered mechanics in the foot have increased values stress on the knee. In mild cases, the patient should wear an orthotic device, both in shoes and at night, to keep the deformity from becoming worse. Shoes that have adequate room for the toes are also necessary. Surgical correction is usually recommended for severe cases.

Metatarsalgia is a symptom of a mechanical problem in the foot. It is characterized by pain and tenderness on the plantar heads of the metatarsals, and it is a particular problem for athletes with a pronated forefoot and/or a cavus foot. It may be anatomical, congenital, aggravated by a long first metatarsal, or secondary to hallux valgus, sesamoiditis, or neurogenic disorders. It is common in runners whose shoes do not provide adequate forefoot cushioning. The athlete may describe the initial symptoms as resembling “having a stone in my shoe.” Over time, a callus forms under the affected metatarsal head, and it further increases irritation by augmenting the load on the metatarsal head. The physician should squeeze each metatarsal head, being careful not to squeeze the tissue between the heads (it contains the interdigital nerves and might create false symptoms). There may be pain in any or all of the four lateral metatarsal heads. Since metatarsalgia is only a symptom of a forefoot mechanical problem, it is essential that anyone attempting to diagnose and treat it have an intimate understanding of the biomechanics of the foot. The initial step in treating metatarsalgia is to relieve the load on the metatarsal heads involved. Begin by placing metatarsal supports posterior to the heads. Prescribe shoes with good forefoot cushioning and flexibility. Place the athlete on a program to strengthen the intrinsic muscles of the foot, and provide arch support and heel wedging as indicated to correct the pronated foot. The gait should also be analyzed for any faults. It will do no good to treat the symptoms and not to correct the abnormal mechanics of the foot.

Too-tight shoes may irritate and thicken the interdigital nerves of the toes, creating a condition known as Morton's neuroma. Turf toe and tennis toe are also shoe-related. Injury to the sesamoid bones affects great-toe flexion.

Morton's neuroma is a condition that affects the interdigital nerves and is characterized by metatarsal pain that may radiate into the third and fourth toes. The underlying lesion is a fibrous thickening of the digital nerve between the third and fourth toes, just proximal branches (Figure 6).

Figure 6. The bones and interdigital nerves of the forefoot, showing the fibrous thickening of the nerve between the third and fourth metatarsals, the most common location of Morton's neuroma

Occasionally, the nerve between the fourth and fifth toes are affected. The etiology is not known but may be due to irritation of the nerve by the protrusion of the metatarsal bones, which causes the nerve to become inflamed, swollen, and scarified. It is likely to be aggravated by a pronated foot and by tight footwear. Removing the tight shoe will usually relieve the pain . This condition may be treated initially by providing orthotic devices for pronation, metatarsal pads, and wider shoes. If these measures fail to relieve the pain, excision of the thickened segment of nerve is recommended.

The first metatarsal is roughly three times larger/wider than the lateral four metatarsals, making it fairly resistant to everstress-type injuries. As mentioned earlier, during toe-off, a higher percentage of the load is transmitted through the second toe and metatarsal. Pronation of the athlete's foot may increase the loads on all the lateral metatarsals, and this repetitive loading can cause a stress fracture. The distal diaphysis of the second metatarsal is the onset common site of stress fractures, but they are also found in the other metatarsals. The onset of pain is usually gradual, but it can be sudden. The foot will be swollen and painful, particularly on weight bearing. A careful history is necessary in these cases because factors such as type of shoe and a change in terrain or mechanics can cause this injury. Initial x-rays are usually negative but will show callus formation over the fracture site after two to four weeks. Radioisotope studies and/or MRI will usually give early confirmation of a stress fracture. Treatment consists of ice, compression, and analgesics for pain. The athlete must not run for four to six weeks. If the pain persists at six weeks, a short-leg walking cast should be applied. The athlete may return to competition upon complete relief of pain, when x-rays show evidence of complete healing, and after appropriate rehabilitation.

With the advent of lighter and more flexible athletic shoes and the firmer surface of artificial turf, sprains of the first metatarso-phalangeal joint have become commonplace. This injury, known as turf-toe, is caused by hyperextension of the great toe, resulting in a sprain of the plantar capsule and ligaments (Figure 7). Though painful, the injury is not disabling unless left untreated. This injury can be treated by simply preventing further hyperextension of the great toe, using either tape or an orthotic device, which will transfer some of the load from the great toe.

A hematoma under the nail of the large or small toe is referred to as tennis toe or marathoner's toe. One of the reasons this condition has become common is the development of very good, nonslip soles for various types of athletic shoes. When running downhill or when decelerating rapidly in tennis or basketball, the shoe stops but the foot continues forward and jams into the toe-box of the shoe. Repetitive jamming can cause subungual hematoma, usually in the large toe.

Figure 7. The location of ligament tear in the turf toe injury.

If the condition is painful, the nail may be drilled to relieve the pressure. Many athletes lose the nail, which generally regrows. Treatment consists of finding shoes with enough room in the toe-box to prevent jamming of the toes.

The two small bones, the sesamoids, embedded in the tendon of the flexor hallucis brevis act to provide greater mechanical advantage for this tendon in flexing the great toe. The great toe, often dorsiflexing to 90 degrees or more, places these bones under a great deal of stress. They can also become irritated from an inadequate amount of cushioning under the ball of the foot. The treatment for this condition is the same as for turf toe: prevent excessive extension of the great toe and provide adequate forefoot cushioning.

When the great toe is suddenly and forcefully hyperextended, one or both of the sesamoids can be fractured. An inordinate amount of vertical force centered over the sesamoid may have the same effect. Again, the treatment is the same as for turf toe, except that it is best to restrict weight bearing until the fracture begins to heal. Since the sesamoids serve a useful function in the great toe, they should be left in place if at all possible. Steroid injections may help control pain. If the pain continues, and when evidence of arthritis or nonunion appears on x-ray examination, then surgical excision may be necessary.

Calluses, blisters, and plantar warts, although seemingly minor conditions, can alter the walking mechanics of the foot and lead to more serious problems. Flat feet and usually high arches also warrant treatment.

A callus is simply a localized thickening of the skin in response to pressure or friction. On the foot, calluses are most commonly found on the ball of the foot and on the heel. A callus is distinguished from a wart in that a callus blends with surrounding tissue, and a wart in circumscribed. Abnormally thickened, painful, or oddly positioned calluses are a diagnostic clue to some mechanical abnormality in the foot. For instance, abnormal callus formation under the metatarsal heads might indicate a deficit in the intrinsic muscles of the foot, causing one or more of the metatarsal heads to carry a disproportionate share of the load. Treatment should first aim to correct the mechanical problem. The callus may also have to be shaved or filed, and better cushioning or support provided to redistribute the load.

Blisters, although seemingly a minor annoyance, are mentioned here because, by altering the mechanics of movement, they make an athlete more vulnerable to other injuries. Encourage players to prevent blisters by thoroughly breaking in new shoes before using them in competition. Two pairs of well-fitted socks will help reduce friction, as will application of powder or lubricant to the feet. If a blister does occur, leave it intact and cover it if possible. If it is in a location where it is likely to rupture, drain it around the periphery with a sterile needle and cover it. If it tears, carefully trim the flap of skin, then disinfect and cover it.

Plantar warts, which may occur on any part of the sole of the foot, are like all warts except that they do not project above the skin surface. They are clearly demarcated from the surrounding skin, and are thereby distinguished from calluses. The wart's surfaces are roughened and, when trimmed, will show pinpoints of red or brown thrombosed capillaries. Since warts are thought to be caused by a virus, simple shaving will not completely relieve the symptoms. If local application of caustics does not relieve the symptoms, then the wart should be burned, frozen, or curetted.

Pes planus, or flat foot, is a common condition of the foot in which the longitudinal arch is reduced or completely flat (Figure 8).

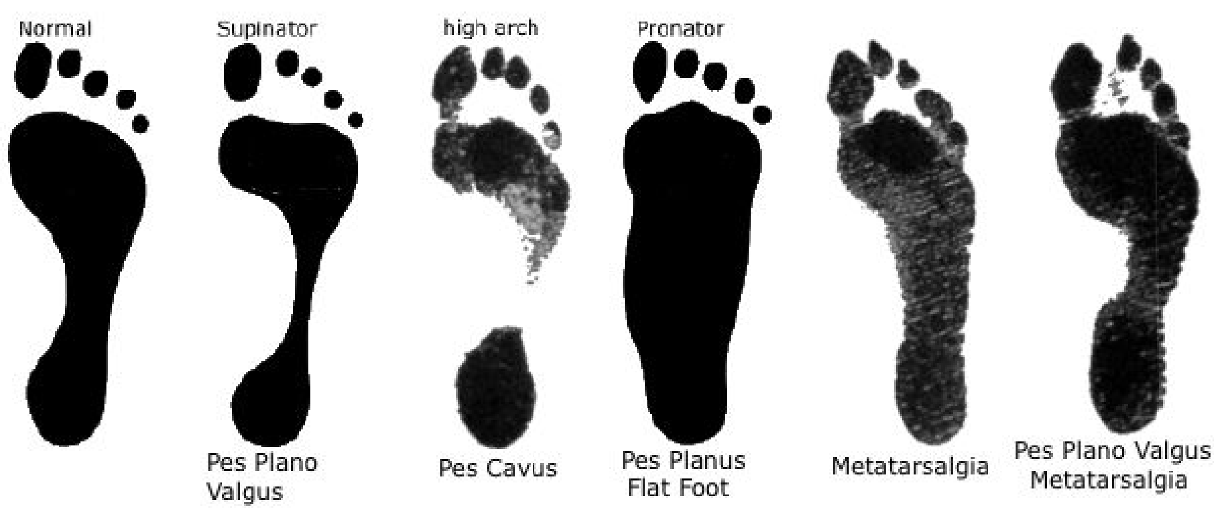


Figure 8. A comparison of a normal footprint with Pes Plano Valgus, Pes Cavus, Pes Planus Flat Foot, Metatarsalgia, Pes Plano Valgus Metatarsalgia

The condition may be congenital, but it may also be caused by an intrinsic muscle weakness or a neurologic deficit in the foot. Pes planus is significant to an athlete because it causes excessive pronation and outward rotation of the foot. These distortions result in loss of shock absorption and alter the load-carrying characteristics of the lower limb. The athlete's performance is affected, and injuries in other areas of the foot or lower body may also result.

All infants are flat footed for up to two years after they begin to stand; when this condition persists into adulthood, it becomes a permanent structural defect in the foot. Most cases of flatfoot, however, come from a breakdown in the support qualities of the intrinsic ligaments and muscles of the foot. This problem can be treated by using an insole (arch support) in a shoe with additional medial wedging at the heel, accompanied by a program to strengthen the muscles of the foot and lower limb.

Pes cavus is a foot with an unusually high arch (Figure 8). The foot and plantar soft tissue are shortened, resulting in the toes clawing and increased pressure on the metatarsal heads. This foot has a reduced ability to absorb shock, and an athlete with this condition is more likely to sustain a sprain of the plantar soft tissue structures. Injuries usually result from the increased pressure on the metatarsal heads or from tears of the plantar fascia. Treatment requires customized orthotic devices with high-shock-absorption characteristics, support for the high arch, and metatarsal bars to distribute the load at the metatarsal heads. Although this condition is usually congenital, the physician should also investigate the possibility of a neurological or muscular foot deficit. Surgery on the soft-tissue structures to relieve symptoms is rarely successful with pes cavus. Resistant symptomatic cases may require osteotomy and fusion to reshape the foot.

Morton's foot involves excessive pressure at the second metatarsal head, which can be conservatively treated. Tarsal coalition and an accessory navicular bone may require surgery.

Morton's foot is characterized by a short, hypermobile first metatarsal. Because of the hypermobility of the first metatarsal, the forefoot may pronate excessively. In this condition, the second metatarsal head bears a greater portion of the load than in the normal foot. The most common complaint associated with Morton's foot is the formation, under the second metatarsal head, of a large, painful callus, which also affects lower limb mechanics. This condition is treated with a Morton's extension, a stiff, padded orthotic device placed beneath and extending beyond the first toe. This extension allows the first metatarsal to assume weight bearing in its normal sequence. Angular osteotomy of the second metatarsal is occasionally required to relieve excessive pressure at the second metatarsal head.

Tarsal coalition is asymptomatic in many people. When symptoms do develop, they usually are in late adolescence or young adulthood in response to the stress of running, jumping, or prolonged standing. This condition is caused by an anomalous fusion of one or more of the tarsal bones. The fusion may be an osseous, cartilaginous, or fibrous bridge between one or more tarsal bones, resulting in a static foot deformity. The most common sites of tarsal coalition are between the talus and calcaneus, and between the calcaneus and navicular bones (Figure 9).

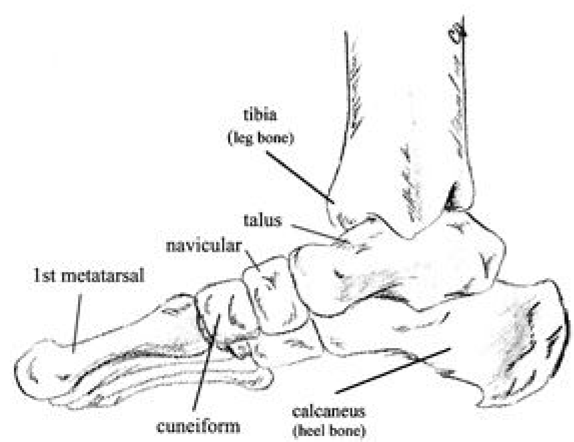


Figure 9. The bones of the rearfoot and midfoot showing the most common site for osseous, cartilaginous, or fibrous tarsal coalition

The pain from tarsal coalition is probably the result of increased stress on the remaining functioning joints in the foot. An x-ray will show the presence of an osseous bridge; the existence of a fibrous or cartilaginous bridge is evinced by a rigid, painful foot that does not respond to conservative treatment. Rest and immobilization will probably relieve the pain, but it is likely that the symptoms will reoccur when the athlete returns to competition. If so, resection of the coalition is indicated.

The navicular bone is at the apex of the arch of the foot. In some people there is an ossification center at the superior proximal aspect of the navicular bone, resulting in a small accessory bone called the os supranaviculare. This condition is asymptomatic in many people. In many athletic shoes without arch support or heel, pronation of the foot causes irritation of this bone when it rubs against the material of the shoe. In an eversion injury to the foot, the accessory navicular bone can be avulsed from the navicular bone or even fractured. In these cases, an x-ray will confirm the presence of an accessory navicular. Mechanical correction of pronation frequently completely relieves symptoms. But if the condition fails to respond to other treatment, removal of the accessory bone is indicated.

Plantar fasciitis and subcalcaneal, retroachillies, or retrocalcaneal bursitis involves pain of gradual onset. Other heel injuries include bruises, stress fractures, and calcaneal apophysitis.

Pain originating under the heel is usually caused by plantar fasciitis (Figure 4). Plantar fasciitis is the result of inflammation and microtearing in the substance of the plantar fascia, usually on or near its origin (Gill, 1996). Onset of pain is usually gradual and may be accompanied by the formation of a traction spur over the medial tuberosity of calcaneus. The spur indicates tugging or tearing of the fascia at this location, but it is not the cause of the pain. This condition occurs most commonly in the pronated foot with a flattened longitudinal arch.

A patient with plantar fasciitis complains of pain under the medial heel, sometimes radiating to the arch of the foot. X-ray examination will be negative unless a traction spur has formed. Palpation will reveal a point of deep tenderness at the anterior medial calcaneus, over the point of attachment of the plantar fascia (Davies, 1999). Treatment should be directed at relieving the tension on the plantar fascia. Mechanical support for the longitudinal arch and control of foot pronation will help, as will the addition of a quarter-inch heel lift. Steroid injection may also be helpful. In chronic cases an MRI or bone scan is indicated to differentiate this condition from a stress fracture. PRP, platelet rich plasma, injections are also currently being used with some success (Van Egmond, 2015).

Pain in the heel may also be the result of an inflamed bursa. Bursitis can occur in the subcutaneous calcaneal region, the retrocalcaneal, or the retrocalcaneal bursa. The retrocalcaneal bursa is the most common affected because it lies superior to the junction of the Achilles tendon and the calcaneus (Figure 10). Improperly fitted footwear or a bony prominence of the calcaneus can cause pressure on the bursa. Constant rubbing and pressure inflames the bursa, which thickens and enlarges, and can become chronic.

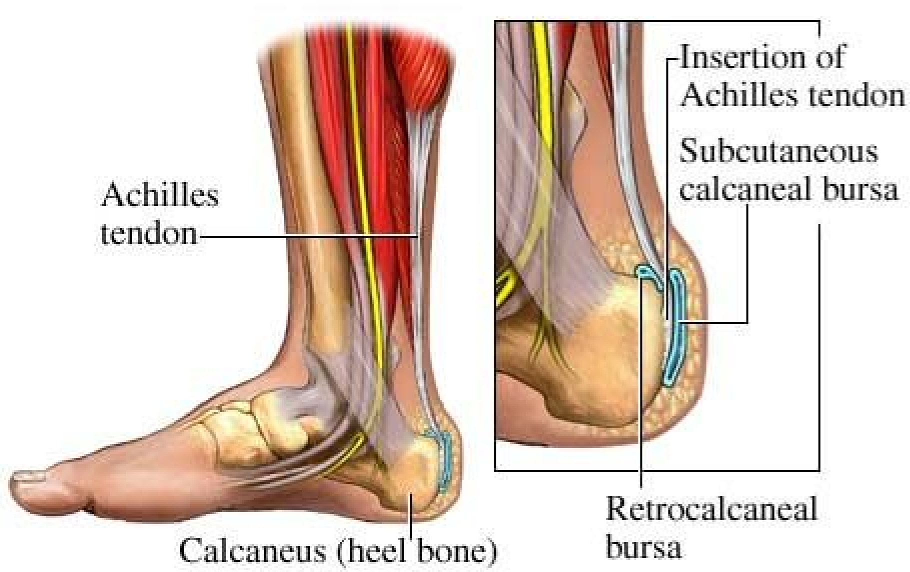


Figure 10. A cross-section view of the foot and ankle showing the positions of bursae that may become inflamed.

The onset of symptoms is usually gradual, and the athlete may relate that the trouble corresponded to the purchase of a new pair of shoes. There may a prominent bump on the outer aspect of the heel. The first step in treating this condition is to make sure the patient wears shoes that do not place pressure on this area of the foot. Local steroid injection into the bursa is very helpful in reducing the inflammation. In rare cases, the bursa must be surgically excised and the bony prominence revised in order to relieve symptoms.

In young athletes, a substantial fat pad under the heel cushions impact as they walk or run. Age and repetitive pounding weaken this fat pad, and it loses its ability to properly distribute loads. Subperiosteal bleeding may develop, and a tender scar may form at the outside, rear portion of the heel. This injury is fairly common among runners who overstrike or frequently run downhill. Often, heel bruise is the result of a shoe with a poorly designed heel or one without sufficient shock absorption in the heel. An athlete with heel bruise should wear shoes with rounded, flared, shock-absorbing heels. A firm heel counter in a shoe that fits snugly will help contain the fat pad and improve its performance. A molded heel cup serves the same purpose. An athlete recovering from this injury should restrict any activity that aggravates the problem and should be encouraged to wear heel cups and cushioning devices in their street shoes.

With any complaint of heel pain, especially in a runner, the possibility of a calcaneal stress fracture should be considered. This type of stress fracture occurs most commonly in beginning runners, runners who train almost exclusively on concrete asphalt, or runners who suddenly increase their mileage or start training on hills. As with other stress fractures, the pain of a calcaneal stress fracture is usually gradual in onset. Because the fracture will not be immediately apparent on x-ray examination, early diagnosis is best made through MRI or radioisotope scanning. Initially, the athlete should rest and cease any activity that may aggravate the pain. Crutches may be needed if the condition is very painful. The patient may put weight on the heel and walk

but must not participate in any activity that puts undue stress on the fracture. A cast or walking boot may be required as well with a period of nonweightbearing. An athlete with a calcaneal stress fracture should be able to return to competition in two to six months.
Calcaneal apophysitis, Sever's Disease, is a painful condition most prevalent in boys between the ages of 8 and 13. With the increase in youth sports, it is becoming a common complaint. Sever's Disease is the result of stress applied by the Achilles tendon to the posterior calcaneal apophysis, which has not yet fused. The disease is classified among general osteochondrosis syndromes and is considered to be a traction injury. The condition is frequently bilateral and is characterized by pain and sensitivity at the back of the heel. Walking may be completely painless, and in many cases the area is only painful when touched. Often, a young athlete will complain of pain when wearing shoes and be without symptoms when barefoot. If the condition is bilateral, an x-ray may be of little value. The fragmentation of the apophysis accompanying this condition is not significantly different in appearance from a normal heel at this age. If the condition is unilateral, more fragmentation may be noted on the affected side. Treatment is symptomatic since the condition is self-limiting. The child's athletic activity should be reduced and a quarter-inch heel lift worn in the shoe until the symptoms subside.
The above discussion is a basic approach to common foot problems. Please contact us if you have any further questions.

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