

**UNITED STATES MARINE CORPS**  
**FIELD MEDICAL TRAINING BATTALION**  
Camp Lejeune, NC 28542-0042

FMSO 202

**Perform Care of the Feet**

**TERMINAL LEARNING OBJECTIVE**

1. Given water and hygiene items, perform individual field hygiene to prevent injuries, maintain health and preserve the fighting force to accomplish the mission. (HSS-MCCS-2024)

**ENABLING LEARNING OBJECTIVE**

1. Without the aid of reference, given a description or list, identify the anatomy of the foot, within 80% accuracy, in accordance with FM 21-18 Foot Marches. (HSS-MCCS-2024e)

2. Without the aid of reference, given a description or list, identify common foot disorders, within 80% accuracy, in accordance with FM 21-18 Foot Marches. (HSS-MCCS-2024f)

3. Without the aid of reference, given a description or list, identify preventive measures for foot disorders, within 80% accuracy, in accordance with FM 21-18 Foot Marches. (HSS-MCCS-2024g)

## 1. ANATOMY OF THE FOOT

The feet are flexible structures of bones, joints, muscles, and soft tissues that let us stand upright and perform activities like walking, running, and jumping. The feet are divided into three sections (see fig 1):

The forefoot contains the five toes (phalanges) and the five longer bones (metatarsals).

The midfoot is a pyramid-like collection of bones that form the arches of the feet. These include the three cuneiform bones, the cuboid bone, and the navicular bone.

The hindfoot forms the heel and ankle. The talus bone supports the leg bones (tibia and fibula), forming the ankle. The calcaneus (heel bone) is the largest bone in the foot.

Muscles, tendons, and ligaments run along the surfaces of the feet, allowing the complex movements needed for motion and balance. The Achilles tendon connects the heel to the calf muscle and is essential for running, jumping, and standing on the toes.

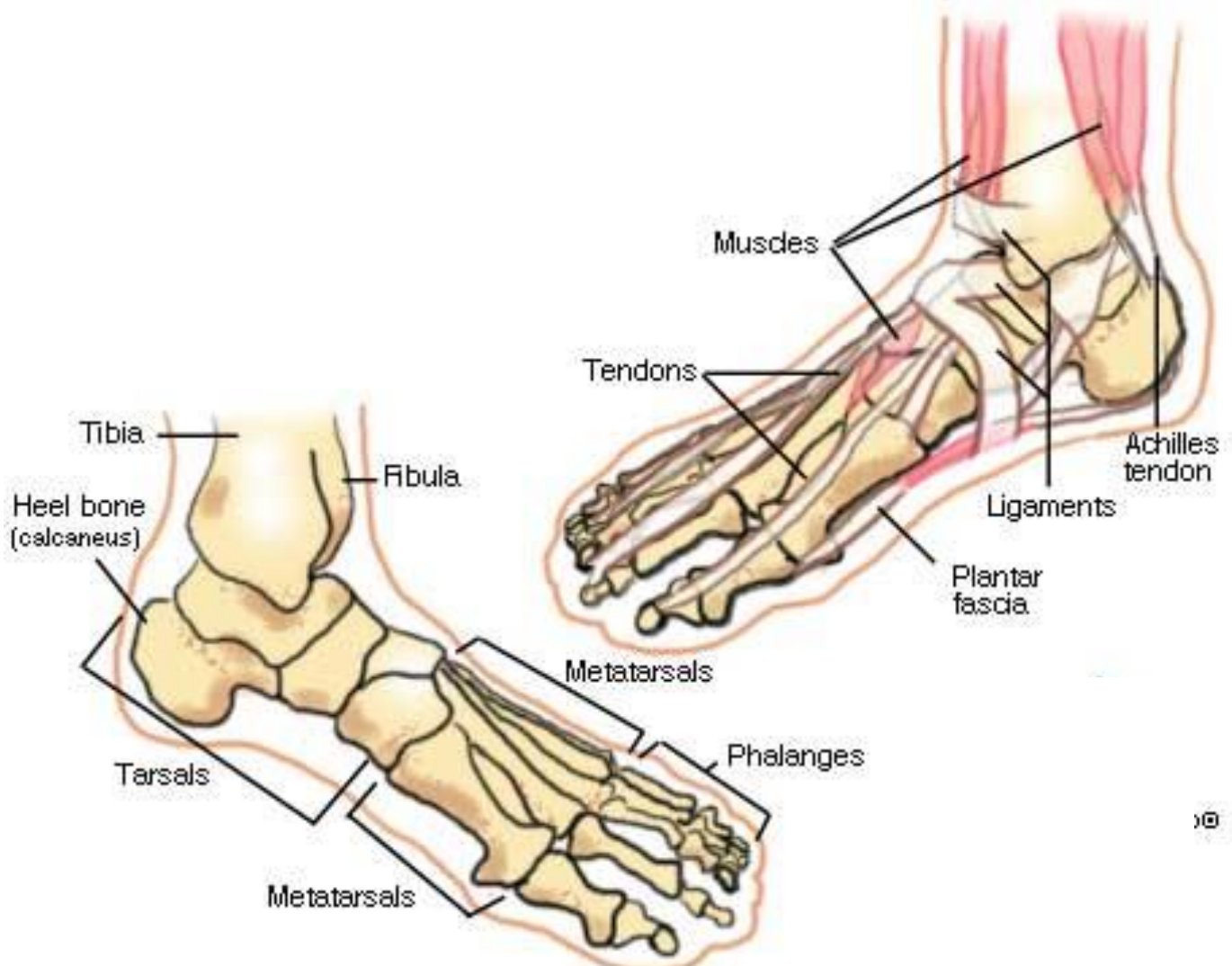


Figure 1. Anatomy of the foot

## 2. TYPES OF COMMON FOOT DISORDERS

Blister - a blister is a defense mechanism of the body. When the epidermis layer of the skin separates from the dermis, a pool of fluid collects between these layers while the skin re-grows from underneath. Blisters can be caused by chemical or physical injury. An example of chemical injury would be an allergic reaction. Physical injury can be caused by heat, frostbite, or friction.

### Causes

- Improperly conditioned feet
- Heat and moisture
- Improperly fitting boots and/or socks
- Friction and pressure

### Signs and Symptoms

- Fluid collection under the skin
- Mild edema and erythema around the site
- Sloughing of tissue exposing sub dermal tissue layer
- Localized discomfort and/or pain

### Treatment

#### Small blisters usually need no treatment

- Clean area with soap and water
- Monitor for signs and symptoms of infection
- Apply a protective barrier (moleskin bandage) around the blister, to prevent further irritation

#### Closed, Large blisters (if affecting individuals gait)

- Wash the area around the blister with Betadine solution or alcohol pad
- Drain as close to the edge of the blister as possible to allow for drainage, and then apply gentle pressure to the blister dome expelling the clear fluid
- Apply moleskin (donut) to skin surrounding the blister, using tincture of benzoin as an adhesive.
- DO NOT PUT ANY ADHESIVE DIRECTLY ON THE BLISTER
- Dust entire foot with foot powder to lessen friction and prevent adhesive from adhering to the socks
- Monitor for signs and symptoms of infection

#### Open blisters

- Wash with Betadine solution or clean with soap and water
- Remove any loose skin with a surgical blade or scissors
- Apply moleskin (donut) to cover skin surrounding the blister, using tincture of benzoin as an adhesive.
- Place a small amount of antibiotic ointment over wound
- Cut a telfa pad and place over open blister
- Apply moleskin over entire treated area to include surrounding skin
- Monitor for signs and symptoms of infection

Athletes Foot (Tinea Pedis) - tinea pedis is a chronic fungal infection of the feet, often referred to as athlete's foot. Athlete's foot is very common and usually begins in early adulthood. Men are more often affected than women. Once affected, recurrences are common.

#### Causes

- Hot humid weather, excessive sweating and occlusive footwear
- Contact with contaminated footwear and floors
- Poor foot hygiene

#### Signs and Symptoms

- Reddened, cracked and peeling skin
- Itching, burning and stinging sensation usually between the toes
- Sore, purulent, weeping rash

#### Treatment

- Apply anti-fungal foot powder daily during work hours – i.e. Miconazole
- Apply anti-fungal ointment daily during rest hours – i.e. Clotrimazole
- Treatment should be continued for 1 week after clearing has occurred
- If the patient fails to respond to treatment, refer patient to medical officer

Ingrown Toenails - an ingrown nail occurs when the nail border or corner presses on the surrounding tissue. This condition is painful and often results in an infection once the skin is broken (see figure 2).



Figure 2. Infected Ingrown Toenail

#### Causes

- The most common causes are improper trimming of toenails and poor hygiene.
- Trauma to the nail plate or toe
- Improperly fitted footwear
- Abnormally shaped nail plate

#### Signs and Symptoms

- Pain along the margin(s) of the toenail. The great toe is the most common toe affected.
- Localized edema
- There may be signs of infection (drainage of pus, blood or watery discharge tinged with blood)

#### Treatment

- Trim a small point off the corner of the nail to relieve the pressure. Remove any dead skin that may have accumulated in the nail groove.
- Elevate the end of the nail to prevent further irritation of the soft tissue. Proper trimming should correct ingrown toenail. If not...
- Surgically correct a chronic ingrown toenail at the BAS, by complete or partial removal of toenail, under the supervision of a clinician.
- If there are signs of infection, antibiotics should be considered.

Corns and Calluses (see figure 3) - a callus is a thickening of the outer layer of skin, in response to pressure or friction that serves as a protective mechanism to prevent skin breakdown. A corn is similar to a callus except it involves a discrete pressure spot, typically over a bone, whereas a callus can form anywhere.

#### Causes

- Tight fitting shoes, due to chronic friction and sheering pressure
- Deformed and crooked toes
- Prolonged walking on a downward slope

#### Signs and Symptoms

- Thickened, dry skin over prominent bones (corn)
- Large patches of thickened, dry skin over friction areas from walking (calluses)
- Pain on direct pressure against the corn
- Skin breakdown and possible infection with continued irritation

#### Treatment

- Debridement of excessive buildup of skin
- Apply pads and devices to the toes to relieve pressure (mole skin, corn pads, etc.)
- Fix the cause (improperly fitted boots)
- In extreme cases, refer to a medical officer

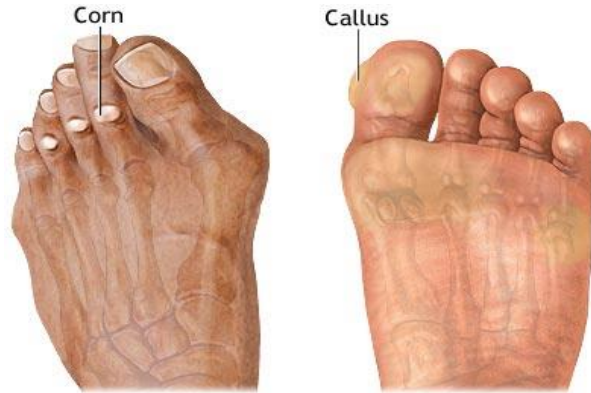


Figure 3. Corns and Calluses

Bunion (see figure 4) - a bunion is an enlargement at the 1<sup>st</sup> metatarsal head of the great toe, which deviates laterally. Often there is no bump, but rather an angulation of the first metatarsal that makes the head of this bone more prominent.

#### Causes

- A minor bone deformity, called hallux valgus, in which the joint at the base of the big toe projects outward while forcing the tip of the toe to turn inward toward the other toes. As a result of the pressure on the deformity, the surrounding tissue thickens.
- This condition may be hereditary.
- Poorly fitted or excessively worn shoes.

#### Signs and Symptoms

- Thickened lump on the medial side of the foot at the base of the great toe
- Erythema
- Pain near first metatarsal head
- Joint stiffness



Figure 4. Bunion (left)

### Treatment

- Wear comfortable, properly fitted shoes with plenty of room in the toe area
- Use of a special toe pad or corrective sock that straightens the big toe
- Non-steroidal, anti-inflammatory medications (NSAIDS)
- Orthotics
- In severe cases, surgery may be required

Plantar Fasciitis (see figure 5) - also known as heel spurs or heel bursitis. Plantar fasciitis is one of the most common foot problems. The plantar fascia's main function is to anchor the plantar skin to the bone, thus protecting the longitudinal arch of the foot. The plantar fascia is strained from overuse, causing pain along the sole of the foot, particularly where the fascia connects to the heel.

### Causes

- Overuse in the physically active or a sudden increase in the volume or intensity of training
- Abnormal joint mechanics
- Tightness of the Achilles tendon
- Shoes with poor cushioning
- Abnormal foot anatomy
- Obesity
- Excess weight
- Improper shoes
- Bio-mechanical problems (mal-alignment of the heel)

### Signs and Symptoms

- Tenderness along the medial fascia
- Constant pain that is worse in the morning upon rising or after physical activity
- Tearing and pulling sensation
- Altered gait

### Treatment

- Stretching and strengthening exercises (lower leg muscles)
- RICE (Rest, Ice, Compression, Elevation)
- NSAIDS
- Heel and arch supports (orthotics)



Figure 5. Plantar Fasciitis

Plantar Warts (see figure 6) - warts that are located on the sole of the foot are called plantar warts. A plantar wart can be found as a single lesion or grouped together. Most common areas include the ball of the foot and heel, where increased pressure and irritation is common. Warts are often ignored until they become painful.

Cause

- Caused by the Human Papilloma Virus (HPV)

Signs and Symptoms

- Plantar warts have tiny dots in the center. These dots are often black from dried blood, due to irritation. Small plantar corns are sometimes mistaken for warts.
- Tenderness

Treatment

- Shave down callus over wart and apply salicylic acid paste (metaplast).
- Apply dressing to keep paste isolated over wart. Apply donut bandage to relieve pressure.
- Leave paste in place for 3 days.
- Repeat treatment in one week.
- Refer to medical officer if no improvement.

Trench Foot/Immersion Foot (see figures 7a and 7b) - a medical condition caused by prolonged exposure of the feet to damp and cold. Trench Foot was given its current name after it was found frequently among World War I troops who had been confined for long periods in trenches filled with standing water. Immersion foot describes a more severe variant of trench foot usually seen in downed pilots and shipwrecked Sailors.

Causes

- Prolonged exposure to wet and cold conditions or outright immersion of feet in water at 32-50° F
- Condition can occur on hands due to damp or cold gloves



Figure 6. Plantar Wart



Figure 7a. Immersion (Trench) Foot

### Signs and Symptoms (EARLY)

- Initially foot is pale, mottled, numb, pulseless and immobile
- After rewarming, severe burning pain and return of sensation

### Signs and Symptoms (LATE 2-7days)

- Limb becomes hyperemic (increased amount of blood flow, skin will be warm and red). Numbness, edema, ulceration, and gangrene may develop.

### Treatment

- Treatment is supportive
- Keep feet clean, warm, dry, and bandaged
- Gentle rewarming
- Elevate affected extremity to reduce edema
- Consider antibiotics if there are signs of infection
- Avoid wearing boots
- Do not drain blisters in the field
- Refer to medical officer
- TACEVAC severe cases



Figure 7b. Immersion (Trench) Foot

Metatarsal Stress Fracture (see figure 8) - a stress fracture is an incomplete break in the bone often seen in intense training programs, when bone absorption exceeds bone-building activity. The most common stress fracture in the foot, known in the military as “March Fracture,” is the second and third metatarsals.

### Causes

- Repetitive stress on a metatarsal due to malposition or abnormal foot structure or mechanics (i.e. flatfoot)
- Increased levels of activity, especially without proper conditioning
- Obesity

### Signs and Symptoms

- Edema in dorsum of foot
- Tenderness at the top of the foot during and after exercise

### Treatment

- Treat as a fracture
- RICE
- NSAIDS
- Rest for two or three weeks until the pain is gone
- Slow return to activity to avoid recurring injury
- Refer to medical officer



Figure 8. Metatarsal Stress Fracture



### 3. **PREVENTIVE MEASURES**

Improperly fitting boots and socks are common causes of foot problems such as blisters, corns and calluses. Use the following preventive measures to educate and supervise personnel on proper foot care and wear. Improper foot hygiene will also lead to foot disorders such as ingrown toenail and athlete's foot.

#### Before Marches

1. Carefully fit new boots.
2. Bring a pair of socks/orthotics you intend to wear with the boots to the store.
3. The toe box should be roomy enough so you can wiggle your toes.
4. The ball of your foot should rest on the widest part of the sole.
5. The forefoot should not be wider than the boot.
6. Determine the boot length; there should be a ½ inch between the end of the longest toe and the end of the boot.
7. Socks should fit snugly on the foot without excess material over toes and the heel.
8. Trim toenails short and straight across.

#### During Marches

1. Keep feet clean and dry and use foot powder.
2. Wear clean, dry, unmended, well-fitting socks.
3. If a person wants to wear two pairs of socks, the outer pair should be ½ a size larger to comfortably fit over the inner sock.
4. During halts, lie with feet elevated at rest points.
5. If time permits, massage the feet, apply foot powder, change socks and take care of blisters.
6. Relieve swelling feet by slightly loosening the bootlaces where they cross the arch.

#### After Marches

1. EARLY ATTENTION IS ESSENTIAL!
2. Wash and dry feet.
3. Treat any blisters, abrasions, corns and calluses.
4. If red, swollen, tender skin develops along the edges of the foot, the foot requires aeration, elevation, rest and wider foot wear.

### **REFERENCES:**

Foot Marches, FM 21-18

## Care of the Feet Review

1. Describe the appropriate treatment for large blisters.
2. Describe the difference between a corn and a callus.
3. List the signs and symptoms of plantar fasciitis.
4. “March Fracture” generally involves which two bones?