CLINICAL IMAGE

BILATERAL FOOT PAIN AND SWELLING

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INTRODUCTION

A 42-year-old female presents with a four-month history of bilateral foot pain and swelling. She admits to frequently walking outdoors in sneakers with holes in the bottom, which allow her feet to get wet, but never thoroughly dry out. Over the last month, she has noticed worsening pain, which she describes as throbbing and burning, development of a foul smell to her feet and discoloration of the plantar aspects of the feet. (Figure 1,2) She denies weeping or drainage, trauma, excessive exposure to cold temperatures, fevers or chills. She admits to noncompliance with oral metformin for a past medical history of type II diabetes.

FIGURE 1:
Bilateral plantar feet

FIGURE 2:
Left plantar foot

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QUESTIONS:

1. What is the most likely diagnosis?

A. Chilblains

B. Frostbite

C. Frostnip

D. Trench foot

E. Diabetic foot ulcer

2. What is the best initial treatment?

A. Amputation

B. Rest, ice, compression and elevation

C. Intravenous antibiotics

D. Removing damp clothing and apply warming packs

E. Massage of the area

ANSWERS:

1. What is the most likely diagnosis?

Correct Answer:
D) Trench foot

The patient was experiencing four months of bilateral foot pain and swelling. During this period, she allowed her feet to get damp frequently. The history and physical exam findings are consistent with trench foot. Chilblains are due to exposure to low temperatures and develop within 24 hours of cold exposure.[1] Chilblains typically involves the toes and there is local cyanosis and pruritis.[1] Frostbite is caused by direct damage of an area of tissue due to direct exposure to cold temperatures and the deterioration and necrosis from dermal ischemia.[2] Frostnip is a precursor to frostbite. It is superficial freezing of the skin that leads to a reversible injury.[3] The patient had no distinct event of exposure to cold temperatures and the patient's physical exam findings are not consistent with frostbite or frostnip. The patient has a history of type II diabetes and is noncompliant with medications; however, a diabetic foot ulcer would present as a distinct area of ulceration.

2. What is the best initial treatment?

Correct Answer:
D) Removing damp clothing and apply warming packs

All answers are possible treatments for trench foot. However, the best initial treatment for this disease is to remove the causative factor.[3] In addition to removing the damp clothing, the area should be washed and have warming packs of 102 degrees to 110 degrees Fahrenheit applied.[4] Amputation would be indicated if conservative treatment failed and the patient developed gangrene. Amputation is performed to reduce the risk of sepsis and death.[5] Rest, ice, compression and elevation (RICE) therapy is commonly used for acute injuries.[6] Rest and elevation of the wound are encouraged to prevent new wounds of the area, although removing the damp clothing would be the best initial treatment.[5] Intravenous antibiotics would be used if there is a concern for infection; however, infection is not the cause of trench foot. Massage of the area should be avoided because of the fragility of the skin.[5]

DISCUSSION

Trench foot is a type of immersion foot syndrome due to exposure to cold, wet conditions without immersion or actual freezing.[5] It was first popularized in case reports beginning with World War I.[7] Soldiers would spend a significant amount of time in trenches that were cold, damp and unhygienic.[8] There are several cases each year due to chronic conditions, sporting activities, advanced age and self-neglect.[9] Other types of immersion foot syndromes include tropical immersion foot and warm water immersion foot.[5]

Trench foot develops in three distinct phases.[10] These include pre-hyperemic, hyperemic and post-hyperemic.[11] The initial pre-hyperemic stage of trench foot usually lasts hours to days and includes erythema, diminished pedal pulses, numbness and a cold-like feeling.[10] The second stage is the hyperemic stage, which can last two to six weeks.[10] In the hyperemic stage, erythema and burning may worsen, as well as progressive edema developing in the affected foot due to vasomotor disturbances.[10] In the final post-hyperemic stage, hyperhidrosis, hyperesthesia and joint stiffness can occur and last for months.[10] Trench foot is a nonfreezing tissue injury, although wet and cold conditions independently can create a suitable environment for trench foot to occur.[12] Therefore, both removing wet garments and rewarming the limb is necessary during initial management.[12] During rewarming, a particular sequence of events occurs. First, the skin becomes edematous, erythematous and hot.[1] Then a burning sensation develops and progressively worsens.[1] The final step that occurs is blistering and the possibility of developing a local gangrene reaction.[1] If there is a recurrence of trench foot, permanent sequelae may ensue.[4] If the series of events affect the same portion of skin repeatedly, the patient may create permanent paresthesia of the skin and hypersensitivity to cold temperatures.[8] Other symptoms that may occur are a decaying odor originating from the extremity's foot and cyanosis.[8]

Several environmental and nonenvironmental conditions can predispose an individual to developing trench foot. The most likely condition is inadequate protection from the environment with cold temperatures, wetness and poor sanitation.[13] Another predisposing factor is standing in one spot for extensive periods, which impedes proper circulation throughout the foot.[7] Both cold temperatures and moist settings constrict vasculature, which inhibits proper nutrient and oxygen supply to tissue.[7] Over time, chronic deprivation of blood flow can lead to gangrene, nerve damage and muscle damage.[13] Trench foot preferentially damages large myelinated nerve fibers, sparing both small myelinated nerve fibers and nonmyelinated fibers.[14] Within those large myelinated nerve fibers, the damage is often seen in the fine terminal cutaneous nerves.[14] Large myelinated damage also leads to weakness, wasting, impaired vibration, loss of proprioception and loss of reflexes, all of which decrease quality of life and impact daily living activities.[15] Chronic conditions such as diabetes mellitus, Raynaud's disease, sickle cell disease and hypothyroidism are diseases that can create predispositions to trench foot.[16]

Treatment for trench foot is directed at creating a suitable setting for tissue health by removing the offending factors and creating a more favorable circulation environment.[16] Primary treatment includes removing wet socks or shoes, cleaning the foot and drying the foot thoroughly.[16] Elevating the feet and refraining from ambulation may assist in the recovery process.[13,15] Warming the feet slowly by using blankets or warming packets is beneficial.[13,16] Rapid rewarming must be avoided in trench foot cases.[12] During the rewarming process, the foot's skin may become erythematous, xerotic and tender.[1] In some cases, secondary bacterial and yeast infections may occur.[4] Rarely, severe cases develop in which feet develop into a greenish-black discoloration, accompanied by blisters, which can indicate emerging gangrene.[13] Analgesia is an important factor to consider while treating a patient with a nonfreezing cold injury such as trench foot. Opioid analgesics and NSAIDs are suitable in providing adequate pain relief.[12] Amputation is necessary if secondary infection is severely extensive but rarely indicated if early recognition of symptoms occurs.[16]

The prevention of trench foot is very important, especially in homeless populations or post-natural disasters.[17] Maintaining proper sanitation by cleaning the feet and allowing them to air-dry can decrease the risk of trench foot.[1] Refraining from cold temperatures for long periods can also reduce the risk of development.[12,13] Avoidance of poor circulation in the lower extremities by moving the feet regularly and elevating them whenever possible can also reduce the trench foot's risk. [16,17]

Trench foot can mimic other foot conditions such as frostbite and chilblains (Table 1). Unlike frostbite and chilblains, trench foot can occur in temperatures well above freezing, potentially as high as 60 degrees Fahrenheit.[1] Chilblains occur in dry and cold settings.[12] Additionally, initial clinical presentation differs between trench foot, frostbite and chilblains. Trench foot has painful skin and pruritus, with a mild feeling of coldness.[1] Frostbite is more likely to present as paresthesias with unusually firm, cool and discolored skin.[1] Chilblains presents similarly and may exhibit a burning sensation, dry skin, cracking and possible ulceration.[1] Treatment for all conditions includes removing underlying agents, rewarming the foot and providing proper analgesia.[1] The health practitioner must be very thorough with the history, complaints and physical examination to form a proper diagnosis.

TABLE 1:[1,2,3,13]

Comparison of trench foot, frostbite and chilblains

TRENCH FOOT	FROSTBITE	CHILBLAINS
Painful skin/itching	Paresthesias	Burning sensation of skin
Cold and blotchy skin	Unusually firm skin	Red, white and blue blotching of skin
Heavy feeling of foot	White or grayish skin color	Intense itching
Redness upon rewarming	Lack of sensation in affected area	Dry skin with cracking
Blisters, gangrene	Blisters, gangrene	Ulceration

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