



Homeless Health Care Case Report:
Sharing Practice-Based Experience
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On the Front Lines: A Case of Trench Foot in a Homeless Woman

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As a result of exposure to inclement weather, cold-related injuries are common among homeless people. Cold-related injuries can be divided into two general categories: non-freezing tissue injuries and those that result from freezing of the tissue, such as frostbite. The most common and mildest form of non-freezing, cold-related injury, chilblains, occurs when the affected extremity is repeatedly exposed to *dry*, cold weather and results in pain, swelling and occasionally blister formation. Frostbite occurs after exposure to severe cold and results in ice crystal formation within the cells which then cause the cells to rupture. This article describes a cold-related tissue injury that may be overlooked by healthcare practitioners who treat homeless clients: Trench foot.

During the First World War, commanders began to notice that soldiers suffered a malady of the feet after prolonged standing in cold water at the bottom of the trenches of the Western Front. The casualty rate from trench foot reached as high as 37 percent. Also called immersion foot and water bite, trench foot occurs when the affected extremity is exposed to cold, *wet* conditions for prolonged periods resulting in vasoconstriction and tissue hypoxia. Exposure to temperatures as mild as 55° F (12° C) for ten hours have been shown to cause trench foot. Sergeant Harry Roberts of the Lancashire Fusiliers when interviewed after the war stated,

If you have never had trench feet described to you. I will tell you. Your feet swell to two or three times their normal size and go completely dead. You could stick a bayonet into them and not feel a thing. If you are fortunate enough not to lose your feet and the swelling begins to go down. It is then that the intolerable, indescribable agony begins. I have heard men cry and even scream with the pain and many had to have their feet and legs amputated.

Alcohol use can diminish the awareness of the symptoms of cold-related injury and exacerbate trench foot. Nicotine is a potent vasoconstrictor which can increase the risk of exposure of the extremities to cold weather. Ill fitting footwear or tight stockings that compromise the circulation to the feet can contribute to the problem. Clients who suffer from peripheral neuropathy due to conditions such as diabetes or chronic alcoholism are particularly vulnerable to injury of the extremities. The lack of resources such as access to clean, dry socks and warm shelter make the homeless population especially susceptible to cold-related injuries. In addition, poor nutrition and dehydration can predispose individuals to trench foot.

Case Description

Psychosocial: A 48 y/o single African American female presented to a homeless shelter health clinic with painful feet. She was unemployed and had lost the support of her family and had been evicted from her mother's house due to marijuana and heroin abuse. She had been staying at the shelter since that time. She was caught in a freezing rain and her socks and fur lined boots became wet. Lacking a change of footwear, she had been wearing the wet socks and boots for three days at the time she presented to the clinic.

Substance use: The client reported occasional marijuana use, heroin use and alcohol use. She denied binge drinking, blackouts, or hangovers. The client also reported tobacco use; 2 packs per day for 20 years.

Physical Exam: The client was alert and oriented, calm and cooperative with exam. T = 96.2, BP = 127/76, P = 95, RR = 18. The soles of both feet were severely macerated (blanched or grey, swollen, waxy and wrinkled appearance of skin after prolonged submersion in water). No blisters or broken skin was observed. The feet were cool to the touch. 2+ pulses were palpable in posterior tibialis bilaterally, nailbeds were blanched with sluggish capillary refill. The client had no sensation to light touch by monofilament test in both feet. She described her feet as numb but experienced a prickly pain when she walked.



Initial diagnosis and treatment/intervention:

Trench foot/ immersion foot. The feet were initially soaked in a warm foot bath, in accordance with the Centers for Disease Control guidelines for the treatment of trench foot. Clean, dry socks were provided. Fur-lined slippers were provided for the client to wear in the shelter. Two additional pairs of socks and talc powder were provided to assist the client in maintaining dry feet. The client elevated her feet whenever possible while at the shelter. She was advised to limit ambulation, quit smoking and avoid alcohol. Smoking cessation options were discussed with the patient and offered (e.g., nicotine patch, classes, support groups).

CDC Treatment Recommendations:

- Treat the affected area by soaking in warm water (102° to 110° F) for approximately five minutes.
- Thoroughly clean and dry the feet.
- Put on clean, dry socks daily.
- Do not wear socks when sleeping.
- Seek medical attention.

Differential diagnoses:

- **Chilblains** – Repeated exposure to dry cold causes surface tissue damage, itching, swelling and pain. Blisters may form. No permanent tissue damage occurs.
- **Frostnip** (first degree frostbite) – Only the surface skin is affected by severe cold but no deep tissue freezing occurs. The skin blanches and becomes numb. No long term damage occurs but the affected area may become hypersensitive to cold exposure in the future. Frostnip occurs in below-freezing temperatures and is therefore a dry cold-related injury.
- **Frostbite** – As mentioned earlier, frostbite involves tissue destruction by actual freezing of cells. Because frostbite is caused by exposure to severe cold, the damage caused by frostbite would typically involve other areas as well such as the ears, nose, and fingers. Frostbite is likewise a dry cold-related injury. Second degree frostbite includes some skin freezing but deep tissues are spared. Blistering can occur and the blisters can become blackened and hard. Healing may take weeks to many months. Deep frostbite (third degree) involves tissue damage to muscles, blood vessels, connective tissue, and nerves. The extremity is hard and numb. Permanent damage or amputation may result.
- **Peripheral vascular disease** – PVD is not a cold-related injury and usually slowly progresses over time. Diminished pulses is another characteristic of PVD not typically associated with trench foot.
- **Peripheral neuropathy** – Numbness is a symptom common to both peripheral neuropathy and trenchfoot but the macerated skin is unique to trench foot. Peripheral neuropathy is usually indolent and progresses slowly over time. Trenchfoot appears in only hours or days.
- **Vitamin B 12 deficiency** – As with peripheral neuropathy, vitamin B-12 deficiency involves no skin changes and progresses over time.
- **Warm weather immersion foot** – also called tropical immersion foot, as the name implies; occurs at warm temperatures and therefore doesn't involve the vasoconstriction associated with trench foot. Warm weather immersion foot sometimes occurs as a result of excessive sweating (hyperhidrosis) in rubber boots and causes painful maceration and thickening of the soles of the feet.

Expected Outcome:

Medical: Gradual improvement in comfort and tissue perfusion.

Actual outcome:

Medical: At one week, her feet showed significant improvement. The soles of her feet were pink. The swelling and pain was reduced. Light touch sensation to her feet had returned.

Social: The client's mother accepted her back into her home. The client stated that she would pursue drug abuse treatment.

As a result of this episode, a sock donation drive was initiated and enough socks were donated by a suburban neighborhood organization to provide all shelter clients with a change of socks.

Summary

Trench foot is a preventable condition which can be mitigated by early intervention but which, because it occurs at above-freezing temperatures, might go unrecognized and untreated. The sequelae of unrecognized and untreated trench foot can be dire.

Failing to retain the lessons of history, the British army recently suffered high casualty rates of trench foot in the Falklands War in 1982 by failing to provide soldiers with adequate footwear and change of socks. The medical community might likewise fail in its duty if cold-related injuries are dismissed out of hand simply because the ambient temperature is above freezing.

Take Home Messages

Clinical:

- If diagnosed early, trench foot is easily mitigated by keeping the feet warm, dry, and elevated.
- The patient should avoid tobacco and alcohol, limit ambulation and keep hydrated.
- The affected extremity should not be warmed near a heat source such as an open fire or stove because diminished sensation may result in severe burns.
- Never rub the feet.
- Advise the client that as the affected extremity warms and sensation returns, it could become exquisitely painful.
- Talc powder should not contain perfumes, which could increase the likelihood of infection.
- Ideally, socks should be a natural fiber such as cotton or wool.

Administrative:

- The shelter will provide socks to shelter clients periodically during wet, cold weather, not just when temperatures fall below freezing.

Community Partnerships:

- A neighborhood sock donation drive was initiated with successful results (over one hundred pairs of socks were donated in the first week).

Policy:

- Examine the feet of all homeless shelter clients who come into clinic to look for signs and symptoms of trench foot.

Sources & Resources

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