

Chapter 4

When the Skin Breaks Down: Early Warning Signs on the Diabetic Foot

Our body uses the skin as the first line of defense against the invasion of bacteria. The skin contains highly specialized structures such as blood vessels, nerves, hair follicles, sweat glands, and sebaceous (oil) glands. The nerve supply to the skin has both sensory and motor functions. The sensory nerves of the skin allow us to feel touch, hot, cold and pain. Involuntary nerves control the sweat glands, the small vessels of the skin, and controls the muscles of the foot and leg. When the nerves and small blood vessels undergo changes inflicted by Diabetes Mellitus, skin color and texture also begin to show the changes. Bluish, reddish and whitish colors of the skin (Fig 4-1), in addition to the presence or absence of hair and the decrease in texture (Fig 4-2) , are all typical signs of a foot problem, affected by diabetes.



Fig 4-1



Fig 4-2



Fig 4-3



Fig 4-4

Only skin changes can be the first sign that indicates the beginning of many complications related to diabetic foot. Skin lesions are common in diabetic foot and occur with other Diabetes-related complications, such as kidney and eye problems.

The most common first and subsequent skin lesions in diabetics are dermopathies. Brown spots are skin lesions (Fig. 4-3) that are commonly located on the shins and are often seen in diabetics. These lesions are about a half inch in diameter, there is a slight hole in the center, often crusted. The reason for dermopathy in diabetics is unknown and does not require treatment, as these lesions improve over time. These rarely ulcerate or become infected.

The next common skin lesion in diabetics is called Necrobiosis Lipoidica Diabeticorum (NBLD) see fig. 4-4. NBLD lesions are usually seen on the shins but can be all over the body. These appear yellow in the central area and brownish red in the periphery. These sting and burn and can become ulcers. Unless the lesions ulcerate, treatment is not required. NBLD often appears before the onset of diabetes and is more common in women. NBLD is considered a more severe form of diabetic dermopathy. The exact cause of NBLD is not very well known.

Blistering diabetic foot lesions are seen in diabetics with poor blood sugar control. These lesions are called Bullosis Diabeticorum. Sometimes they can be superficial or deep blisters on the skin. The size of the lesions can vary from small to large blisters. (fig. 4-5). These blisters will develop quickly without any injury and are painless. Once the blister occurs, immediate medical attention is required, and it needs to be differentiated from injuries caused by poor circulation or neuropathy. The blister heals very slowly but sometimes an infection occurs and spreads to deeper structures in the foot, causing infection of the bone. (fig. 4-6).



Fig 4-5



Fig 4-6

Itching is quite common in diabetes. When severe itching occurs on the foot, it is very uncomfortable and disturbing especially at night. The cause is unknown but generally affected people have severe dry skin. Sometimes uremia (a condition caused by excessive toxic byproducts in the blood) in diabetes causes itching. Treatment is required because infection is common in the itchy area. Steroid-containing creams may be helpful in relieving itching, and blood sugar control appears to be helpful as well.

TEST YOURSELF

(T F) True or false

1. T F Brown patches on the skin of legs of diabetic indicate the beginning of neuropathy of diabetic.
2. T F Dermopathy of Diabetic does not require any treatment.
3. T F lipoidica diabeticorum (NBLD) Necrobiosis is the skin lesion that appears as yellow in the center and brown in the periphery.
4. T F Bullosis diabeticorum T F is the blister that appears without the wound. You should immediately release it with a clean needle and remove all the liquid out of the blister.

1. (F) 2. (T) 3. (T) 4. (F)

The Small Cut That Can Take Your Leg: Infections in the Diabetic Foot

A small cut in the skin of a diabetic foot can lead to a serious infection. Although the end result of foot infection may be loss of the leg or life, or both, the initial event can be so trivial and insignificant, even in a non-diabetic person. Initially it may be an incident such as stepping on a piece of glass careless cut of corns and calluses, or a blister from walking with a new pair of shoes. Most diabetics have altered sensation of the feet and no minor cut or trauma does not produce any painful symptoms until the infection becomes noticeable (Fig 8-1).



Fig 8

Many diabetics neglect corns and calluses because they do not appreciate the damage that can be produced by these seemingly trivial ailments.

The human body is populated by many different kinds of bacteria and fungi that vary with location, environment, and skin condition. For example, the area between the toes has a larger number and types of bacteria than anywhere on the body because of the moisture between the toes. Moisture favors the growth of bacteria and fungi. The feet have the lowest temperatures compared to other parts of the body that stimulate the

faster growth of bacteria and fungi. It is a known fact that diabetic feet are more prone to infection. Diabetics do not have problems with the immune system of antibodies, nor does it cause their antibodies to react differently than non-diabetics, when they are invaded by bacteria. High blood sugar by itself does not generally increase the growth rate of bacteria either. The exact mechanisms of the increased severity and frequency of infection among diabetics is not yet very clear. However, pre-existing circulation problems in the foot and diabetic infections and neuropathies become more dangerous than infection in non-diabetic people. Progress to a major infection with tissue death can be much faster while the diabetic patient is ignoring of the contagious process that he suffers without painful symptoms in neuropathic feet. The small capillary vessels around the infection site clot causing further tissue death. In addition to capillary blood vessels clotting in the area of infection, some bacteria produce toxic substances that also cause even more tissue death. When tissue death becomes so extensive, then the area becomes gangrenous. Sometimes the infection process progresses to any tendon in the foot, and then the infection will follow the course of the tendons that are deeper in the leg. This rapid spread of infection is a serious threat to life and limbs.

SOFT TISSUE INFECTION

Diabetic foot infections can occur in an insulin-dependent as well as a non-insulin-dependent patient. This generally occurs in diabetics with neuropathy of the feet where diabetics tend to neglect the initial signs of infection due to the absence of pain symptoms. Gangrene that precedes infection occurs from toxic material that is produced by bacteria. The tissue becomes inflamed and the enzymes in the small arteries fill with clots that surround the infection site, destroying the tissue.

Oftentimes, the infected foot of the diabetic patient contains gas within the soft tissue. Generally, the gas formed by bacteria produces an odor and does not require oxygen to survive. When there is reduced blood flow to the infection site due to pre-existing circulation problems, the proliferation of bacteria that do not require oxygen to survive can be extensive and very destructive to the tissue. Generally, most diabetic foot infections are caused by a mixture of many different kinds of bacteria.

The best way to treat diabetic foot infection is prevention. Knowledge and understanding are the key. When you notice a small cut on the skin, even if it is calluses or a simple cut, the first thing you should do is wash the area thoroughly with running water. Do not wash the area with strong chemicals such as iodine, alcohol, or

hydrogen peroxide as these chemicals actually damage skin cells (cytotoxic) and become an additional source of infection. Immediately move your foot away and raise it above the level of your heart. If you notice swelling, redness, and a bad odor, you should call your doctor. Your doctor needs to cut the surgically infected area and drain the pus. This must be done early in the course of infection and is the most important part of therapy. Your doctor will take some fluid sample from the contagious site where the bacteria have grown and send it to the laboratory. This is an important step in treating the infection because it will tell us the type of bacteria causing the infection and will give us the choice of the type of antibiotics that will destroy the bacteria.

Initially without knowing the types of bacteria, your doctor will put you on an antibiotic based on the nature of the wound, the appearance of the wound, and your general health condition. The most effective way to administer the antibiotic is intravenously rather than orally. As we mentioned earlier, diabetic foot infection is generally caused by a combination of bacteria (Polymicrobial). Therefore, you need several types of intravenous antibiotics in the hospital. If your doctor sends you home on oral antibiotics, assuming the infection is caused by "staph," and it is the most common bacteria that causes skin infection, you are at a very great risk because most diabetic foot infections are caused by a combination of many different types of bacteria. Bacteria that do not require oxygen to grow will not be killed by common oral antibiotics and the infection can spread quickly to involve the entire leg. Failure to recognize the nature of these destructive bacteria in the initial stage of local infection can have disastrous consequences. For the diabetic patient with kidney damage, the doctor will be adjusting the dose frequently during the course of treatment.

BONE INFECTION IN THE DIABETIC FEET

Bone infection, also known as osteomyelitis, in diabetic feet is one of the most serious problems. In most cases, this osteomyelitis, along with a chronic ulcer on the sole of the foot, begins as a callus. If a diabetic has an ulcer on the sole of the foot, this usually takes months or years to heal, if they do heal. If the ulcer is neglected or poorly healed, the bacteria that enter the ulcer spread inside the foot, reaching the bone. Bone infection is common in diabetic feet with neuropathy and circulation problems. It may go unnoticed, however there may be little or no pain, redness may be absent, and swelling may not be noticeable. To treat the bone infection, you need surgical removal of the infected bone and about six weeks of intravenous antibiotics. If these conservative treatments fail, amputation is indicated. One condition that mimics bone

infection is Charcot's foot (Chapter 7). Charcot's foot is red, swollen, and hot. These signs and symptoms are similar to a bone infection. Careful examinations and diagnostic MRI will be important to determine if it is a Charcot bone or bone infection. I saw a diabetic patient who had an amputation that thought the patient had a bone infection when in fact, he had the initial stage of Charcot's diabetic foot.

TEST YOURSELF

(T F) True or false

1. T F Diabetics have problems with the body's immune system therefore they are more prone to infection than non-diabetics.
2. T F Swelling and redness in your foot and leg means there is a serious contagious process going on even if you are not experiencing any pain.
3. T F Diabetic foot infections are caused by many different types of bacteria.
4. T F Bone infection is common in diabetic feet with neuropathy and circulation problems.
5. T F Diabetic Charcot foot means foot bone infection.
6. T F as long as there is no pain, there is no bone infection.

1. (F) 2. (F) 3. (T) 4. (T) 5. (T) 6. (T)