

Diabetic Ulcer

OVERVIEW

Ulceration is an extremely common complication in diabetic patients. Ulcers can occur in up to 12% of the diabetic population. The plantar surface is the most common site of ulceration, especially at areas of bony prominence. Complications related to diabetic ulceration are responsible for up to 85% of lower extremity amputations.

PATHOGENESIS

The presence of neuropathy is the key factor in development of diabetic ulceration. Protective sensation is lost and the patient is unaware of the trauma occurring. Autonomic dysfunction also occurs which leads to excessive dryness because of loss of normal glandular secretions. Dry cracked skin is more susceptible to breakdown. Bony prominence secondary to Charcot arthropathy will also increase shear stress in the area. Repetitive trauma produces tissue inflammation which then progresses to tissue necrosis and ulceration.

CLINICAL PRESENTATION

Presentation may vary dramatically. A patient may present with what they believed to be a simple "blister" that has not resolved. Alternatively the patient may present with florid sepsis secondary to deep soft tissue infection or osteomyelitis.

EXAM

Assess patient's foot and ankle alignment to identify obvious deformity. Note range of motion of ankle and hindfoot. The Silverskold test (comparison of maximal ankle dorsiflexion with knee extended and flexed) will distinguish between isolated gastrocnemius or Achilles contracture, both of which are associated with increased forefoot loading pressures. A complete neurovascular exam is essential. Screening for protective sensation is most commonly done with Semmes-Weinstein 5.07-mm monofilament.

The ulcer should be evaluated for location, depth, undermining, and appearance of the underlying tissue. Note signs of erythema or purulent drainage. Exposed bone should be

noted. An acutely swollen, erythematous foot with Charcot arthropathy can mimic infection and the distinction between the two conditions is critical. Elevation typically alleviates erythema in acute Charcot but not infection. Further distinction may require advanced imaging.

CLASSIFICATION

Wagner Classification

Stage 0	Skin intact but with bony prominence – “at risk”
Stage 1	Superficial ulcer
Stage 2	Full thickness ulcer
Stage 3	Deep abscess or osteomyelitis
Stage 4	Partial gangrene of forefoot
Stage 5	Extensive gangrene

Brodsky Depth – Ischemia Classification

Patients are evaluated separately for depth and ischemia, and assigned both a number and letter grade.

Depth

0	At risk, no ulcer
1	Superficial ulcer, non-infected
2	Deep ulcer with tendon or joint exposure
3	Extensive ulceration or abscess

Ischemia

A	Not ischemic
B	Ischemia without gangrene
C	Partial forefoot gangrene
D	Complete gangrene

IMAGING STUDIES

Plain radiographs in a weight bearing position allow assessment of bony deformities and evaluation of osteomyelitis. Identification of deep abscess or acute osteomyelitis may require MRI. When presence of infection is in question, an indium scan may be useful.

Non-invasive vascular studies should be obtained to assess vascularity and healing potential. Absolute transcutaneous oxygen pressure of greater than 30 mmHg and ankle-brachial indices of greater than 0.45 are considered appropriate for wound healing.

TREATMENT

Prevention is a primary focus in all patients with diabetes and peripheral neuropathy. Patients with these conditions should be counseled regarding proper foot care. They need to check their feet daily. They should be admonished not to walk barefoot, even indoors. Custom total contact inserts constructed with a closed cell foam such as Plastizote and extra depth shoes are critical. Proper hygiene is also important. Because of autonomic dysfunction that occurs with neuropathy, they should moisturize their feet with a lanolin based ointment.

Treatment of an acute ulcer can vary depending on many factors. The presence of an active infection may require urgent debridement and IV antibiotics. An ulcer without acute infection will usually respond to in-office debridement and offloading. Total contact casting and strict non-weightbearing are commonly used. Frequent debridements in office may be required throughout the healing process. Achilles lengthening or gastrocnemius recession can be useful in minimizing ulcer recurrence.

In patients with Charcot arthropathy, ulcers can form under bony prominences secondary to deformity. In these cases, reconstruction with correction of the deformity may be considered. It is also an option to remove the bony prominence creating the ulcer without extensive reconstruction in an otherwise braceable foot.

Amputation is also an appropriate treatment option when necessary. Level of amputation depends on location of wound and vascularity.

CONCLUSION

Diabetic ulceration is a common problem seen in combination with peripheral neuropathy. It can cause significant loss of productivity and costly medical expenses in complicated cases. Prevention can be effective at decreasing serious complications secondary to this condition. Improper or delayed treatment can lead to soft tissue infection, osteomyelitis, or even

amputation. High grade or otherwise complicated ulceration demands prompt treatment or subspecialist referral. Appropriately aggressive treatment can be effective in resolving and preventing recurrence of diabetic ulceration.

Written by Brian Kleiber, MD

Reviewed by Thomas Dowd, MD

Last reviewed June 2015