

Foot Care in Patients With Diabetes Mellitus*

AMERICAN DIABETES ASSOCIATION

Foot ulcers and other foot problems are a major cause of morbidity, mortality, and disability in people with diabetes. In the presence of neuropathy and/or ischemia, the sequence of minor trauma leading to cutaneous ulceration and wound-healing failure is a frequent cause of lower-extremity amputations in diabetic patients (1). Once the amputation of one limb has occurred, the prognosis for the contralateral limb is poor (2).

Techniques to prevent amputation range from the simple, but often neglected, foot inspection to complicated vascular surgery. Appropriate management can prevent and heal diabetic foot ulcers, thereby greatly reducing the amputation rate (3–7). The guidelines herein outline the essentials of foot care for people with diabetes.

Patients are at high risk of developing foot ulcers if they have either loss of protective sensation (neuropathy severe enough that they cannot feel injury) or vascular disease. In such “at-risk” patients, additional risk factors are structural deformities, and skin or nail abnormalities. Patients who have experienced previous ulcers or amputation have, by definition, the necessary risk factors for future ulceration. All patients should be seen at regular frequent intervals by a qualified health care professional with experience in the care of diabetic foot problems.

Patients have a low risk of developing foot lesions if they have none of the above abnormalities. They should receive instruction on basic preventive foot care and have routine foot inspections. Patients at low risk should be reassured, so that they do not worry unnecessarily about the possibility of ulceration or amputation.

GENERAL GUIDELINES FOR FOOT EVALUATION — A comprehensive screening including vascular, neu-

rological, musculoskeletal, and skin and soft tissue evaluations should be done at least annually. The emphasis of this examination must be on identifying high-risk feet, specifically feet with loss of protective sensation or with significant vascular disease. The skills needed to identify these high-risk characteristics should be in the repertoire of the diabetes primary care provider or could be deferred to another qualified health care professional. Once high-risk abnormalities are discovered, a foot exam should be performed at each routine diabetes visit several times a year, and ongoing care by a qualified health care professional with experience in the care of diabetic foot problems should be initiated.

The vascular evaluation should include palpation of the pulses in the lower extremities and inspection of the feet and legs for any gross ischemic changes. If the patient has disabling claudication or a non-healing ulcer in an obviously ischemic limb, a vascular consultation should be requested. A patient without claudication or ulcer but with evidence of significant peripheral vascular disease should be considered a high-risk patient and should have a foot exam at each visit.

The neurological exam should include a sensorimotor examination of the lower extremities. The goal of this examination is to ascertain whether protective sensation has been lost. A 10-g (5.07) Semmes-Weinstein monofilament should be used. If a patient cannot consistently feel the touch of this monofilament, protective sensation has been lost. If loss of protective sensation is discovered, a comprehensive ongoing program of patient education, appropriate daily self-care, professional nail and callus care, and appropriate footwear should be initiated. All patients with loss of protective sensation should wear at least an athletic shoe or a shoe of

similar design. Currently, Medicare will provide reimbursement for one pair of extra-depth shoes and three pairs of inserts or one pair of custom-molded shoes plus two additional pairs of inserts each year for patients with high-risk feet.

For a patient at high risk, the evaluation should include assessment of soft tissues and a lower-extremity musculoskeletal exam, including assessment of gait and determination of range of motion at the ankle and hallux. The most important aspect of the soft tissue exam is, of course, checking for ulcers or other skin breakdown. Many ulcers begin at the site of a callus. Pre-ulcers (blisters, macerated skin, hemorrhage into callus) are indicative of extremely high-risk feet and mandate immediate intervention. Effective treatment for fungal infection is now available.

PATIENT EDUCATION — Patients with diabetes must be educated and understand proper foot care. Low-risk patients should be instructed about 1) foot hygiene, 2) proper footwear, 3) avoidance of foot trauma, 4) the need to stop smoking, and 5) actions to take if problems develop, which include seeing a health care professional when needed. It is always important to instill confidence in the low-risk patient to prevent unfounded fear. Good basic foot hygiene in a low-risk patient should guarantee that major problems will not develop. In addition, high-risk patients and their family members should be taught to perform daily foot care and should understand the role that loss of protective sensation plays in foot injury. Education should continue until the patient can verbalize and demonstrate proper foot care practices. Neuropathic and vascular complications and their relationships to foot problems should be explained.

DIABETIC FOOT ULCERS — Prompt and proper care of diabetic foot ulcers is essential. The health care professional should 1) establish the ulcer’s etiology; 2)

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*Currently there is a committee considering a major revision of this position statement.

measure its size; 3) establish its depth and determine the involvement of deep structures; 4) examine it for purulent exudate, necrosis, sinus tracts, and odor; 5) assess the surrounding tissue for signs of edema, cellulitis, abscess, and fluctuation; 6) exclude systemic infection; and 7) perform a vascular evaluation. The ability to gently probe through the ulcer to bone has been shown to be highly predictive of osteomyelitis (8).

Radiological examination

A radiological examination is frequently useful to exclude subcutaneous gas, presence of a foreign body, osteomyelitis, and Charcot's foot. Plain radiographs may demonstrate periosteal resorption and osteolysis, which are consistent with but not diagnostic of osteomyelitis. To differentiate osteomyelitis from Charcot's foot, additional imaging studies (e.g., triple-phase bone scan, ¹¹¹In white blood cell imaging, magnetic resonance imaging) or a bone biopsy may be necessary.

Bacterial cultures and antibiotics

Bacterial infections of foot lesions are commonly polymicrobial. Thus, if infection is suspected, broad-spectrum antibiotic coverage should be initiated immediately and modified as necessary based on culture results and the patient's response to therapy. Deep specimens obtained by curettage of the base of the wound may provide the most reliable culture results.

Debridement

All abscessed infections should be incised and drained. Debridement must extend to viable noninfected tissue.

Wound care

The use of topical agents in the treatment of diabetic foot ulcers is controversial. Although several topical agents (e.g., antiseptic solutions, growth factors, tissue supplements) have been proposed to speed the healing of diabetic foot ulcers, there are no adequately controlled studies that demonstrate their efficacy. Prolonged immersion of the foot in water is not recommended.

Mechanical stress

It is essential to minimize weight bearing on the ulcer. Modifications of weight bearing include the use of bed rest and crutches, total-contact casts, shoe inserts, and special shoes. All patients for whom bed rest is prescribed should have heel and ankle protection and daily inspection of both legs. When neuropathic ulcers continue to be subjected to even limited weight bearing, they will not heal. The most common cause of nonhealing of a neuropathic ulcer is ongoing mechanical trauma.

Circulation

Patients with slow or inadequate healing who have decreased pulses and/or pressures by Doppler examination may be candidates for vascular reconstruction. Vasodilator drugs have not been demonstrated to aid in the healing of diabetic foot ulcers. Vasoconstrictor drugs should be avoided.

Metabolic control

Infection and/or inflammation may result in widely fluctuating blood glucose levels. Surgical and antibiotic treatment of abscesses or deep infection may help bring blood glucose levels under better control. Conversely, patients with severe hyperglycemia may have decreased ability to fight infection; therefore, good control of blood glucose should be a primary goal of the patient's total care. Poor nutritional status may hinder the healing process and should be promptly addressed.

Posthealing treatment

Patients with healed foot ulcers are at risk for future ulceration. The education program for these patients should stress daily examination of the feet and prompt notification of a health care provider if problems arise (see PATIENT EDUCATION). Patients whose work requires them to be on their feet for extended periods may require job modification. Prescribed footwear will benefit patients with a history of foot ulcers. Footwear options include walking or athletic shoes, soft insoles, extra-depth shoes with custom-molded inlays, and custom-molded therapeutic shoes. If unfa-

miliar with therapeutic footwear, the health care provider should seek assistance from a qualified footwear specialist.

CHARCOT'S FOOT—The physician must be aware that an acutely swollen foot with no significant radiographic changes in a patient with diabetes may represent the early stage of Charcot's foot. When present, this condition requires careful observation and appropriate rest, elevation, and immobilization. Distinguishing Charcot's foot from infection or monarticular arthritis may be difficult, and careful follow-up is required. The most important task is recognition. It is mandatory that every patient with recognized or possible Charcot's foot be referred to a specialist experienced in treating this condition.

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