Introduction

In the year 2000, it was estimated that the prevalence of diabetes would rise from 2.8% to 4.4% by 2030 (1). This is an alarming prediction in light of the high number of complications that are associated with this disease. The US Health and Nutrition Survey further demonstrated that 28.5% of those with diabetes develop peripheral neuropathy, 9.5% develop signs of peripheral arterial disease, and 7.7% develop foot ulcers; approximately three times the frequency observed in non-diabetic individuals (2).

As a result of these complications, there were approximately 29,000 diabetics admitted to U.S. hospitals with a diagnosis of cellulitis or infected ulcers, 84,000 admitted for other cellulitis or abscesses of the foot, 217,000 admitted for ulcerations of the lower extremity, 66,000 admitted for osteomyelitis, 134,000 admitted for chronic non-healing ulcers, and 79,000 admitted for lower limb atherosclerosis with ulcers or gangrene in 2002 (3), A staggering percentage of these individuals undergo surgical intervention while in the hospital. Even more are treated as out patients for less complex problems as well as elective procedures. These numbers do not include the thousands of patients with diabetes admitted for Charcot reconstructions, and other conditions not included in the preceding statistics. Among patients who develop ulcerations, it was found that 24% required surgery in the form of an amputation at some level, costing an average of $44,790 (for surgery and hospitalization) (4).

Other studies have also demonstrated surgical amputation rates in 16% of the cases where ulcers developed. Ultimately, when you combine all of the different diabetes-specific complications as well as the nondiabetes-related reasons that people with diabetes may need surgery, it represents millions of cases in the United States alone (5).

There are many risks associated with surgery, and these are magnified in patients with diabetes, particularly if they are poorly controlled, and have a history of cardiovascular, renal or other systemic comorbidities. The situation becomes even more complex in the presence of infections or gangrene, and/or when complex reconstructive surgery is needed (5).

The goal of soft tissue coverage is to restore form and function. Ideally, soft tissue coverage of the foot would involve primary repair without tension and involve use of neighboring sensate native tissue that are capable of withstanding the shear and tangential forces sustained during gait. Most diabetic foot wounds are small in size and amenable to proper debridement and local wound care measures followed by correction of the underlying skeletal deformity. However, larger wounds, especially those associated with exposure of underlying soft tissue and osseous structures, usually require more elaborate soft tissue wound coverage techniques (6–8).

In the surgical treatment of diabetic foot ulcers, tumors, malignant lesions, callosities, or traumatic lesions, the reconstructive surgeon is faced with the challenge of repairing the tissue defect or deficit. Healing the wound can be achieved by secondary intention, direct

primary closure, skin grafting, myocutaneous graft, local cutaneous skin flaps, or free tissue transfers. Local flap closure restricts to the isolated pathology without sacrificing healthy tissue (9).

In the diabetic foot, a muscle flap is used predominantly for soft tissue closure over bone defects as a result of deformities associated with a Charcot foot and/or resected osteomyelitis. Exposed retained hardware that may not suitable for removal is best covered with a muscle flap and if a free tissue transfer is not feasible or indicated (10, 11).

Gangrenous wounds of the leg and foot are common expressions of arterial insufficiency. In diabetic patients, these lesions frequently become infected with subsequent exposure of critical structures. The wounds frequently require operative debridement, leaving wounds that are large and expose vital structures. Because of arterial insufficiency local flaps may not be large enough, and/or may be unreliable even if the extremity is revascularized, essentially placing the involved limb at risk for subsequent amputation. It has been well demonstrated that the diabetic population with lower extremity wounds has a higher rate of lower extremity amputation when compared with the normal population (12).

Revascularization may be required to bring in a new blood supply and accomplish limb salvage. Because of the size of some wounds, even with adequate arterial inflow they may not heal without some type of soft tissue procedure, and the extremity may still be at risk for amputation. Until the 1980s, reconstruction of large foot wounds in

diabetics was uncommon. Free tissue transfer can cover vital structures, achieve wound closure of large defects, and bring in a reliable source of vascularized tissue that introduces antibiotics and immune cells that can combat infection. A multidisciplinary team approach is required to perform these procedures and maximize the chance for a successful outcome in the diabetic patient with peripheral vascular disease (13).

Aim of the Essay

The purpose of this study to review diabetic foot ulcers with especial emphasis on surgical reconstruction of these ulcers.