



Conservative Surgical Treatment of Infected Ulceration of the First Metatarsophalangeal Joint With Osteomyelitis in Diabetic Patients

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ABSTRACT

Ulceration of the plantar aspect of the first metatarsophalangeal joint is a common localization in the diabetic foot. Conservative treatment of this lesion is a challenging problem, performed through the soft tissues and osseous debridement. The present study included a cohort of 28 patients affected by diabetes mellitus and a first ray lesion penetrating the bone. After surgical debridement with removal of the infected bone, we positioned antibiotic-loaded bone cement and stabilized the treated area with an external fixator. All patients with critical limb ischemia had their vascular disease treated before the procedure. The mean follow-up was 12.2 ± 6.9 months. Four patients developed a relapse of the ulceration after the procedure. In the post-operative period, 1 patient (3.57%) developed dehiscence of the surgical site and underwent a second procedure. In the follow-up period, 2 patients (7.14%) experienced bone cement dislocation. In 1 of these patients, a new ulceration was observed dorsally to the surgical site. The approach was surgical revision with bone cement replacement and stabilization with a new external fixator. In the other patient, given the absence of ulcerations, the cement was removed, and arthrodesis with internal stabilization using 2 cannulated screws was performed. One patient (3.57%), who had developed a relapse of ulceration after recurrent critical ischemia, underwent a percutaneous revascularization procedure and transmetatarsal amputation. During the follow-up period, no ulceration recurrences, transfer ulcerations, shoe fit problems, or gait abnormalities were detected in the other 24 patients. Our study presents the results of a technique requiring a 1-stage surgical approach to a relatively common problem, which is often difficult to solve.

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Conservative treatment without amputation of ulcerative lesions involving the metatarsophalangeal joint (MTPJ) of the great toe is very often difficult. The standard of care usually consists of extensive debridement of the affected soft tissues and osteomyelitic foci. This approach could easily make the great toe unstable, deformed, or nonfunctional. The treatment of choice is very often amputation of the first ray. Although allowing for complete removal of all the infected tissues, first ray amputation also significantly changes the weightbearing pattern of the foot and could alter the balance of the forefoot intrinsic musculature, leading to lesser toe deformity (1).

Lavery et al (2) studied a group of patients after first ray amputation. They noted significantly increased pressure in the forefoot and

heel compared with the contralateral foot (2). This same group reported an increased rate of lesser toe deformities in feet with great toe amputation compared with the contralateral side (3). These findings could help to explain the high rate of reamputation after great toe or first ray amputation. Murdoch et al (4) reported an overall 60% reamputation rate for patients undergoing amputation of the hallux or first ray.

The increase in deformity after first ray amputation could then predispose the patient to ulceration and subsequent amputation, which has historically been relatively high. In an attempt to avoid all these complications and perform salvage treatment of the first ray, several alternative treatments have been suggested. Chan et al (5) described simple resection arthroplasty performed by dorsal approach with closure over drains. These investigators reported that the resulting mobile flail joint quickly fills up with granulation and fibrous tissue, thus allowing for a reasonable range of movement.

Roukis and Landsman (6) have reported a 2-stage reconstruction with initial resection of all infected bone at the MTPJ, placement of antibiotic-loaded polymethylmethacrylate beads and an external

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Fig. 1. Clinical presentation of plantar ulceration over first metatarsal head.

fixator, and subsequent metatarsophalangeal fusion with an interpositional iliac crest graft (6).

The same investigators subsequently described a single-stage procedure using antibiotic-loaded cement. They excised all infected soft tissue and bone and then resected portions of the phalanges and metatarsal head, filling the defect with antibiotic-loaded cement. This was then covered with a great toe fibular adipofasciocutaneous island flap (7). Bowker (8) described a single-stage procedure performed through a medial incision for the resection of the first MTPJ using

beveled surfaces to retain motion. The plantar ulcer was also debrided and the joint temporarily stabilized with Kirschner wire (8,9).

Our study describes a procedure based on sequestrectomy and ulcerectomy with antibiotic-loaded bone cement and stabilization using an external fixator in an attempt to obtain wound healing, remove the infection focus, and stabilize the medial column, reducing the risk of repeat ulceration of the first ray and the lesser rays. This procedure is thought to allow for appropriate debridement of the infectious tissues and preserve the first ray and its potential contribution to weightbearing. The placement of a Kirschner wire in addition to a monoplanar external fixator allows for temporary stabilization of the soft tissues with the possibility of partial fusion or fibrosis after sequestrectomy at the first MTPJ.

Patients and Methods

From September 2011 to September 2013, 28 consecutive patients (11 females [39.29%] and 17 males [60.71%]) with diabetes mellitus were surgically treated for a wound complicated by first ray osteomyelitis.

The criteria for inclusion in the present study were as follows: a diagnosis of diabetes mellitus and peripheral neuropathy associated with plantar or marginal-medial ulceration with osteomyelitic involvement of the first MTPJ. The diagnosis of neuropathy was established with Semmes-Weinstein 5.07 monofilament by 3 of us (L.D.P., A.C., M.P.). The diagnosis of osteomyelitis was determined from radiographs and magnetic resonance imaging and on the clinical observation of a longstanding open wound with exposed and palpable bone by 3 of us (L.D.P., A.C., M.P.). All patients had exposed bone within the ulcer bed, either the sesamoids or the metatarsal head. Figs. 1 through 3 show the most frequent clinical and radiographic findings.

The indication for the procedure was plantar or medial ulceration involving the first metatarsal head with underlying osteomyelitis. All patients enrolled in the present study were followed up to determine the current status of their feet. Any lesions and



Fig. 2. Anteroposterior preoperative radiograph.



Fig. 3. Magnetic resonance imaging study confirming osteomyelitis of the first metatarsal head.

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