Hallux Interphalangeal Joint Arthroplasty

This is a well-known intervention for a hallux interphalangeal ulcer.

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Abstract

This case report describes a well-known intervention for a prevalent lesion, namely the diabetic foot ulcer planter to the hallux of the interphalangeal joint. The hallux interphalangeal arthroplasty remains a valuable procedure for treating the chronic neuropathic ulcer. This article presents a case report of a frequently encountered condition. A discussion of the evaluation and management of this lesion is provided using this particular procedure. Although the duration of follow-up was only six months as opposed to the 12-month minimum required, the discussion presents a review of the pathomechanics involved in its etiology. Just prior to the patient’s 12-month follow-up, she passed away from complications related to pneumonia.

Introduction

Hallux interphalangeal ulcerations or ulcerations along the plantar aspect of the hallux interphalangeal joint is a common but challenging condition in the diabetic patient. One of the most common sites of wounds on the sole of the diabetic foot is the plantar hallux. Furthermore, plantar ulcerations of the hallux are common occurrences in patients with diabetic neuropathy. Diabetes-related distal symmetric polyneuropathy results in a loss of protective sensation and subsequently a number of biomechanical risk factors that conspire to cause tissue injury. Thus, the common link between diabetes mellitus and biomechanical changes of the foot are a direct result of diabetic peripheral neuropathy.

Diabetic peripheral neuropathy is a symmetrical polyneuropathy that presents in a stocking and glove distribution with distal to proximal migration. The neuropathy can be sensory, motor, and autonomic in nature. Sensory symptoms include numbness, tingling, and loss of protective sensation. Autonomic neuropathy often occurs with longstanding diabetes. It often accompanies the sensory symptoms. It often presents with increased skin temperature, decreased sweating, and dry skin. These combined factors play an additional role in tissue injury and breakdown. A motor neuropathy results in muscle weakness or limited motion of the intrinsic muscles of the foot.

During the normal gait cycle, at heel strike, the foot becomes a mobile adaptor to the terrain by unlocking the STJ and pronating the foot, and the leg internally rotates. The normal loading sequence of the forefoot during the gait cycle begins laterally and proceeds medially with 70 percent of normal toe loading occurring through the hallux. The metatarsals become fully loaded, and all five metatarsals are bearing weight at the end of the contact period. It is at this time that the vertical ground reaction forces peak at the ball and

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The pathologies that result from this abnormal pronation may include hallux abducto valgus, hallux limitus, hallux rigidus, and hammer toes. Any biomechanical abnormality that results in hyperpronation can predispose the medial aspect of the great toe to ulceration. The resultant gait will often produce a final toe off along the medial aspect of the interphalangeal joint and may clinically manifest as a callus or ulcer. Another common mechanical abnormality resulting in increased stress across the interphalangeal joint is hallux limitus or rigidus. As motion becomes limited in the metatarsal phalangeal joint, compensation takes place distally at the interphalangeal joint. Again, in the diabetic foot, these additional negative forces can lead to tissue breakdown and ulceration. Limited joint mobility is associated with higher plantar pressures. The normal range of hallux dorsiflexion is approximately 50 degrees to the ground. Marked reductions of hallux dorsiflexion are associated with high hallux pressures. Non-enzymatic glycosylation causes excessive cross-linking of collagen, and hence makes collagen stiffer, limiting the mobility of joints, ligaments, and muscles. These high plantar pressures and limited joint motion can all lead to tissue injury. Any biomechanical abnormality that results in hyperpronation can predispose the medial aspect of the great toe to ulceration. Non-enzymatic glycosylation causes excessive cross-linking of collagen, and hence makes collagen stiffer, limiting the mobility of joints, ligaments, and muscles. These high plantar pressures and limited joint motion can all lead to tissue injury. Non-enzymatic glycosylation causes excessive cross-linking of collagen, and hence makes collagen stiffer, limiting the mobility of joints, ligaments, and muscles. These high plantar pressures and limited joint motion can all lead to tissue injury.

Figure 2: Pre-op foot x-ray of the left foot showing loss of joint space at the first MPJ and IPJ, resulting in a rigidus deformity.

Figure 3: Pre-op three-phase bone scan showing increased uptake of the hallux left foot.

Figure 4: Transverse Incisional Approach: A transverse incision is placed over the hallux interphalangeal joint.

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hallux ulceration in the diabetic patient. Studies conducted by Armstrong, et al., in 2003, were the first studies reporting its safety and efficacy in treating these chronic wounds of the plantar hallux as compared to non-surgical therapy. Simple resection arthroplasties have few complications which included infection, wound dehiscence, failure of fixation, recurrence of the lesion, and digital mal-alignment.

Case Report

A 70-year-old woman presented to Noyes Health/University of Rochester Medical Center with a neuropathic ulcer on the plantar medial aspect of the great toe of the left foot over six months duration. The patient could not remember sustaining trauma to the area or any activity that could have precipitated the lesion. The patient was treated with conservative care for over six months. The conservative care of the ulcer consisted of serial debridement in the office, offloading and pressure relief, use of various dressings, and antibiotic therapy.

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of the distal phalanx were submitted to pathology and microbiology for analysis. The wound was closed in anatomic layers and sterile dressings were applied (Figure 6). None of the resected specimens were positive for osteomyelitis. In this case, where osteomyelitis was suspected, pin fixation was not used. Post-operative x-rays were taken to ensure adequate resection of bone (Figure 7).

In this case, the patient developed wound dehiscence along the dorsal incision; however, she did go on to heal using traditional wound care in less than four weeks. There was no incidence of a recurrence. This case was followed for a minimum of six months post-operatively.

Discussion

The management of a hallux interphalangeal ulceration is often difficult owing to the predisposing factors, including biomechanical, structural abnormalities, and any co-existing morbidities. Increased stress or pressures at the great toe can result in callus formation. In the case of a diabetic patient with neuropathy, this operation had to be made to perform a more curative procedure, and thus avoid amputation of the hallux. The hallux interphalangeal joint arthroplasty proved to be a viable option in the treatment of this particular ulcer.

The hallux interphalangeal joint arthroplasty proved to be a viable option in the treatment of this particular ulcer. Not only did it prove to be curative, but the procedure was technically not difficult and involved minimal soft tissue and osseous disruption.
the first ray but improved it. Potential complications were minimal. These outcomes must be weighed against those of the traditional alternative... amputation of the hallux.

Care must be taken to select patients for this procedure. Most of these patients who exhibit diabetic neuropathy have co-existing morbidities making them less than ideal surgical candidates. Traditionally, surgeons have been reluctant to perform this type of operative procedure on the diabetic patient; however, as our knowledge of diabetes has increased, as well as advances in endovascular repair, more and more of these patients are being considered acceptable surgical candidates. Adherence to strict glycemic control should be implemented prior to surgical intervention to ensure good outcomes. In this case, the patient’s hemoglobin A1c was 5. Despite the patient’s other medical conditions, she tolerated IV sedation anesthesia, and the procedure went very well.

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In this case, once the hallux interphalangeal joint arthroplasty was performed, and the complication of the wound dehiscence along the incision healed, the patient’s condition resolved and she healed eventuantly. The patient suffered numerous co-existing morbidities and passed away short just of her 12-month follow-up secondary to complications related to pneumonia. PM

References
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