CHAPTER 49

HALLUX INTERPHALANGEAL JOINT ULCERATION: A Surgical Correction

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Ulceration along the plantar and plantar-medial aspect of the hallux interphalangeal joint is a common yet challenging condition in diabetic patients. The neuropathic foot is at great risk of developing callus and ulceration, due to the significant forces assumed by that portion of the great toe during gait. Once the ulcerative process has started, the weight-bearing stresses can retard normal healing leading to a chronic non-healing wound. Although conservative care is often effective in the early stages of breakdown, the more severe and chronic cases may require surgical intervention. The authors present their experience using resection arthroplasty of the interphalangeal joint to address these chronic, recalcitrant ulcers.

ETIOLOGY

In combination with the typical neuropathic factors, ulcerations along the hallux interphalangeal joint can result from a host of structural and mechanical factors (Fig. 1).

Structural Etiologies

Proximal and distal phalangeal exostosis, degenerative arthritic disease with secondary joint limitus/rigidus, and an accessory interphalangeal sesamoid bone represent some of the most common structural causes of ulceration.

In the presence of a large exostosis, secondary shoe pressure and ground reactive forces can lead to increased tissue stress (Fig. 2). When combined with the peripheral neuropathic changes that are typically seen in the diabetic patient, tissue destruction and ulceration are likely to occur.

In the presence of advanced degenerative arthritic disease, a secondary interphalangeal joint limitus/rigidus deformity may result (Fig. 3). This restriction of joint motion will often result in an apropulsive gait, with the toe-off phase producing excessive pressure medially at the interphalangeal

Figure 1. Typical ulceration along the plantar-medial aspect of the great toe.

Figure 2. Note the large exostosis at the medial aspect of the distal phalangeal base.

Figure 3. Severe loss of joint space at the interphalangeal joint resulting in a rigidus deformity.

Figure 4. Note the location of the intracapsular sesamoid bone.

joint. When combined with the neuropathic changes noted earlier, tissue necrosis and ulceration are probable.

The presence of an interphalangeal sesamoid bone can also be a structural etiology to ulceration (Fig. 4). Although well-placed within the joint capsule and above the long flexor tendon, the additional stress created by this bone can be enough to predispose the neuropathic patient to ulceration.

Mechanical (Functional) Etiologies

Any biomechanical abnormality that results in an over-pronatory foot type can predispose the medial aspect of the great toe to ulceration. This occurs as a result of the medial column and first ray becoming unlocked and elevated during midstance and propulsion. The resultant gait will often produce a final toe-off along the medial aspect of the interphalangeal joint. Clinically, this may manifest as a callus or ulceration.

Another common mechanical abnormality resulting in increased stress across the interphalangeal joint is hallux limitus or rigidus. As motion becomes limited at the metatarsophalangeal joint, compensation takes place distally at the interphalangeal joint. Again, in the diabetic foot, these additional forces can lead to tissue breakdown and ulceration.

TREATMENT

Many interphalangeal joint plantar ulcerations can be treated successfully with conservative measures. Traditional ulcer management (debridement, alleviation of pressure, antibiosis) is usually very effective in the earlier stages of development. As the ulcer becomes more chronic and penetrates deeper tissues, conservative care becomes less effective and surgical intervention may be necessary.

Despite the fairly high frequency of ulcerations at this location, little attention has been given to the interphalangeal joint in the past. Perhaps the reluctance of surgeons to operate on diabetic patients may account for this. However, as our knowledge of the diabetic disease increases, these patients are being declared acceptable surgical candidates more frequently than ever before.

The authors use an arthroplasty of the interphalangeal joint to treat this particular form and location of ulcer. This procedure was first described for this patient population by Rosenblum et al. in 1993.[1] In their study of 40 patients, a healing rate of 91%, without recurrence, was noted.

TECHNIQUE

The patient is placed supine on the operating table and the foot is prepped and draped in the usual sterile fashion. A local digital nerve block is performed, usually in conjunction with intravenous sedation. Hemostasis may be achieved via pneumatic ankle tourniquet or by injection of epinephrine (1:400,000 dilution). Epinephrine should be used with extreme caution in the diabetic population.

A three centimeter transverse incision is made across the hallux interphalangeal joint following normal anatomic skin lines (Fig. 5). The dissection is deepened through the superficial fascia, and superficial vessels are ligated via electrocautery. The deep fascia is demarcated by the extensor hood apparatus and the extensor halluces longus tendon. An incision may be made along the medial aspect of the tendon, or by transection of the tendon, allowing exposure of the joint (Fig. 6). Following incision of the deep fascia, the head of the proximal phalanx of the great toe is exposed dorsally within the wound. The phalangeal head is transected with a sagittal or oscillating saw, and then released from the medial and lateral collateral ligaments with a #15 blade (Fig. 7). As the phalangeal head is removed from the wound, appropriate cultures and biopsy can be taken as needed. This is typically done in instances where an active ulceration is present at the time of surgery.

The plantar aspect of the joint is then inspected. Thick, fibrous portions of the plantar capsule or an interphalangeal sesamoid bone may be present, and should be excised if detected. The wound is then copiously irrigated with sterile saline. At this stage of the procedure, a decision must be made regarding pin fixation. The authors prefer to stabilize the arthroplasty site with a .062 K-wire whenever possible. In cases of suspected osteomyelitis or when active purulence is encountered, pin fixation is not recommended. When pin fixation is used, the wire is typically driven into the base of the proximal phalanx. If further stability is needed, then further penetration into the distal metatarsal shaft is acceptable. The wound is then closed in anatomic layers, and a sterile dressing is applied (Fig. 8).

Intraoperative radiographs may be taken to verify proper positioning of the wire, or to insure

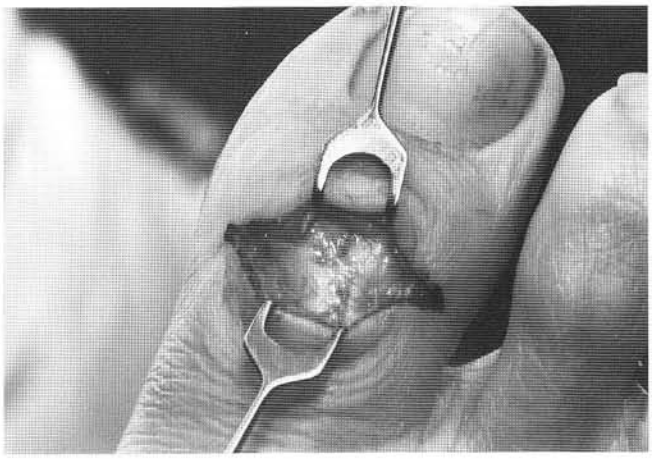

Figure 5. A transverse incision is placed over the interphalangeal joint.

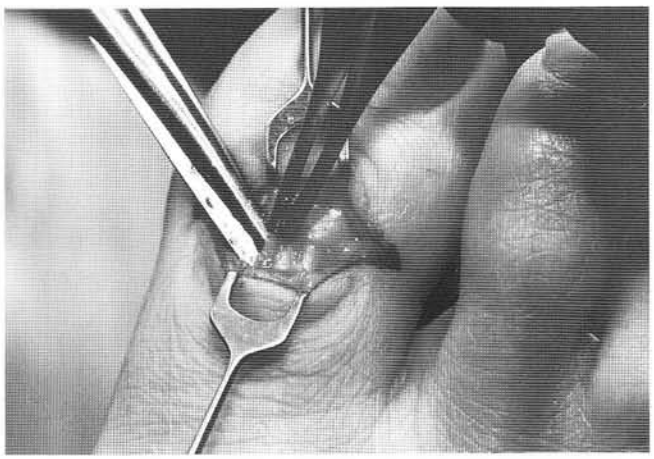

Figure 6. Sharp dissection is used to open the deep fascia and reflect the tendon laterally.

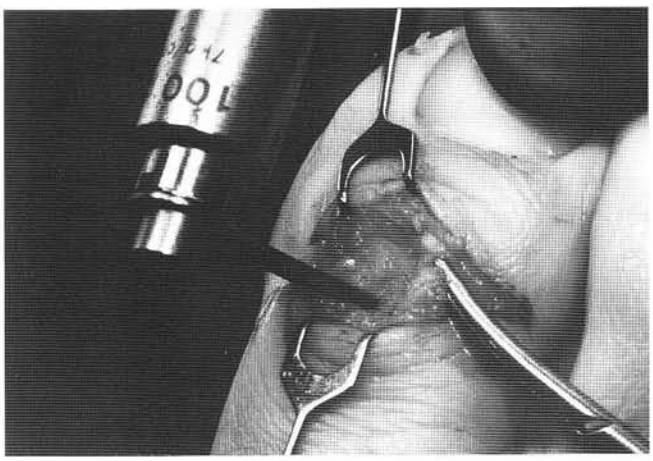

Figure 7. Power instrumentation is used to resect the proximal phalanx.

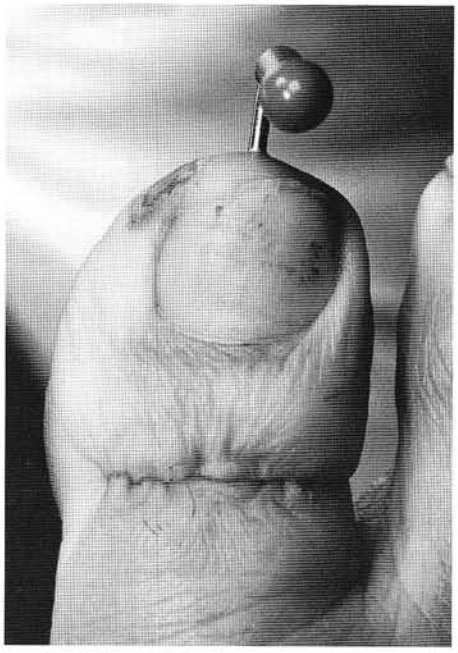

Figure 8. Appearance of final closure with pin fixation.

adequate resection of bone in cases of suspected osteomyelitis. Wire fixation usually remains intact for a period of four to six weeks in an effort to reduce edema and to allow for digital stabilization.

Potential complications of the procedure include infection, wound dehiscence, failure of fixation, recurrence of the plantar lesion, and digital malalignment. The authors have experienced few complications over the past four years using this procedure.

RESULTS

The authors have performed this procedure 25 times on 23 patients. The underlying etiology on all patients included, at least in part, a neuropathic foot. The cause of neuropathy in all cases was diabetes. A large exostosis, degenerative joint disease, or the presence of an interphalangeal sesamoid bone were noted in 21 of the 25 cases. The other 4 cases were due to abnormal mechanics about the medial arch and first ray resulting in increased pressure across the medial aspect of the interphalangeal joint.

Twenty-three cases healed without complication in less than four weeks. Two cases required a second procedure which included further debridement of bone and soft tissue. In each of these two cases, the resected bone from the first procedure was positive for osteomyelitis. In the twenty-three uneventful cases, none of the resected specimens were positive for osteomyelitis. There have been no cases of recurrence in any of the twenty-three cases, including the two that required additional procedures. All cases have been followed for a minimum of 6 months postoperatively.

SUMMARY

Simple resection arthroplasty of the interphalangeal joint has proven to be a very useful treatment option in recalcitrant cases of diabetic ulceration along the great toe. The procedure is technically not difficult and involves minimal soft tissue and osseous disruption. Because the patient can be weight bearing immediately, minimal morbidity is associated with this procedure. The procedure also benefits the patient from a functional standpoint. Due to the joint preservation nature of this procedure, the mechanics of the first ray are minimally affected, and in many cases improved. This is in obvious contrast to the traditional alternative, amputation of the hallux.

REFERENCE

1. Rosenblum BI, Giurini JM, Chrzan JS, Habershaw GM: Preventing loss of the great toe with the hallux interphalangeal joint arthroplasty. *J Foot Ankle Surg* 33:557-560, 1994.