

## Evaluation of Hallux Interphalangeal Joint Arthroplasty Compared With Nonoperative Treatment of Recalcitrant Hallux Ulceration



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### ABSTRACT

Patients with chronic diabetes can develop plantar hallux ulcerations secondary to neuropathy, increased pressure, and deformity. The present retrospective study evaluated the efficacy of hallux interphalangeal joint (HIPJ) arthroplasty to address recalcitrant ulceration. Two groups of patients with diabetes were compared: a surgical group of 13 patients and a nonsurgical standard therapy group of 13 patients. The patients in the surgical group underwent HIPJ arthroplasty. All the patients in the standard therapy group received local wound care and offloading. The mean duration of follow-up was 19.5 (range 1.2 to 47.9) months, and the mean age was  $55 \pm 13.0$  years. Statistical significance was found in the surgical group for faster time to healing (3.5 weeks [2.5, 4.25] vs 9 weeks [2, 17.29],  $p = .033$ ) and lower incidence of ulcer recurrence ( $8\% \pm 7.69$  vs  $54\% \pm 53.85$ ,  $p = .031$ ). There were also fewer amputations in the surgical group ( $0\% \pm 0$  vs  $38\% \pm 38.6$ ,  $p = .063$ ). To our knowledge, only 1 other published study has evaluated HIPJ arthroplasty as a treatment of recalcitrant hallux ulceration. The present study adds comparison data from a nonoperative standard therapy group and found that HIPJ arthroplasty is an effective curative treatment option to address chronic plantar hallux ulcerations in diabetic patients with neuropathy.

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Ulcerations are a frequent antecedent of elective lower extremity amputations in patients with diabetes-related peripheral neuropathy. Hallux ulcerations often develop secondary to increased plantar pressures caused by a combination of nonreducible pedal deformities, limited joint mobility, and neuropathy (1,2). Traditionally, neuropathic ulcerations are treated nonoperatively, using a combination of offloading techniques and local wound care. Offloading techniques are imperative in the reduction of pressure required for healing and in neuropathic ulcer prevention after healing. Despite external offloading, such as custom molded insoles and shoes, ulcer recurrence frequently develops secondary to structural deformity. Ulceration recurrence has ranged from 30% to 87% (2). Operative intervention is considered when ulcers have been unresponsive to conservative treatment (1–6). We present a retrospective study evaluating the efficacy of hallux interphalangeal joint (HIPJ) arthroplasty as a treatment of recalcitrant hallux diabetic neuropathic foot ulcer. Indications, technical pearls, and case examples are also presented. We hypothesized that patients who had undergone HIPJ arthroplasty



Fig. 1. A chronic plantar hallux interphalangeal joint ulceration in a 53-year-old male with type 2 diabetes mellitus and peripheral neuropathy.

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**Conflict of Interest:** None reported.

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**Fig. 2.** A dorsal incision was placed, overlying the hallux interphalangeal joint.

would yield favorable outcomes in the immediate and long-term periods compared with standard care consisting of local wound care and offloading alone. To assess this hypothesis, we reviewed the data from a series of patients who had undergone either HIPJ arthroplasty or standard, nonoperative therapy for the treatment of recalcitrant neuropathic HIPJ ulceration.

#### Patients and Methods

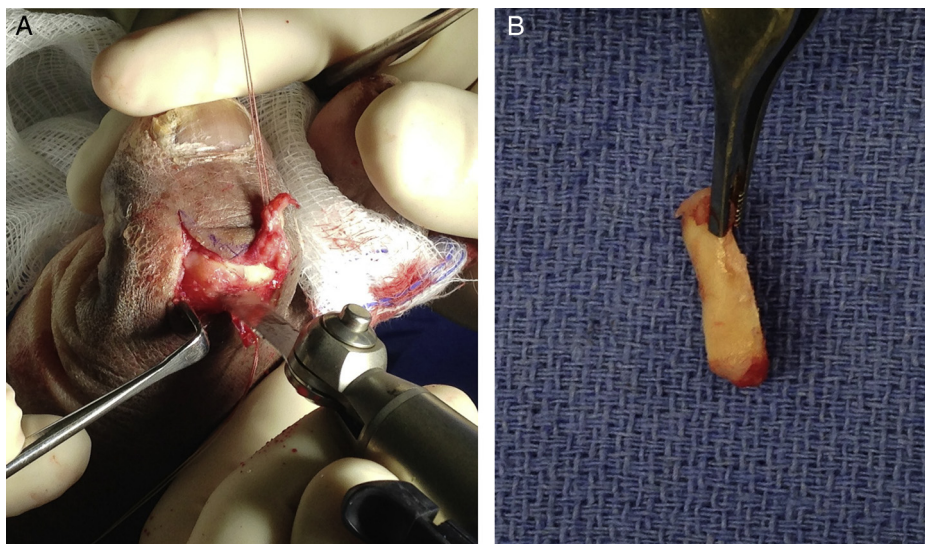
The patients were treated within the Podiatric Section of the Department of Orthopaedics from January 2008 to May 2013 (5 years, 3 months) at the Cleveland Clinic (Cleveland, OH). The present investigation was conducted with institutional review board approval. Patients with chronic plantar or plantar-medial ulcerations were identified using an electronic medical record database. Specifically, an institutionally designed Smartform filter in the Epic Electronic Health Records system (Epic, Verona, WI) was applied to generate a list of patients with a history of plantar



**Fig. 3.** Dissection exposed the extensor hallucis longus tendon, which was either retracted or transected for joint visualization and later repaired.

or plantar-medial hallux lesions. Patients with diabetic neuropathy or idiopathic peripheral neuropathy and plantar hallux ulcerations, of any size or depth, that had been present for longer than 6 weeks were included for review. Patients were excluded if the duration of the ulcer was less than 6 weeks or if the ulceration was not located on the weightbearing surface of the hallux. Patients with active soft tissue or osseous infection were included. Patients with incomplete documentation and those who had been lost to follow-up were excluded. The patients who underwent HIPJ arthroplasty were identified using the aforementioned electronic medical record database. A search using Current Procedural Terminology code 28160 (Current Procedural Terminology, American Medical Association, Chicago, IL) was performed on the list of subjects with hallux ulcerations after applying the exclusion criteria.

The patients who underwent the procedure were included in the HIPJ arthroplasty surgical group. Patients treated nonoperatively were placed into the control group. Selection of this group was made on the basis of propensity score matching with the goal of achieving similarity on age, diabetes, peripheral neuropathy, body mass index, and ulcer volume. Matching was performed using the R package Matching. The patients



**Fig. 4.** Partial proximal phalangeal head resection. (A) A sagittal saw blade was used to resect the cartilaginous surface of the proximal phalanx. (B) A minimal amount of cartilage and bone was removed to preserve the hallux length.

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