Efficacy of Fifth Metatarsal Head Resection for Treatment of Chronic Diabetic Foot Ulceration

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This study compares the potential benefit of fifth metatarsal head resection versus standard conservative treatment of plantar ulcerations in people with diabetes mellitus. Using a retrospective cohort model, we abstracted data from 40 patients (22 cases and 18 controls) treated for uninfected, nonischemic diabetic foot wounds beneath the fifth metatarsal head. There were no significant differences in sex, age, duration of diabetes mellitus, or degree of glucose control between cases and controls. Patients who underwent a fifth metatarsal head resection healed significantly faster (mean ± SD, 5.8 ± 2.9 versus 8.7 ± 4.3 weeks). Patients were much less likely to reulcerate during the period of evaluation in the surgical group (4.5% versus 27.8%). The results of this study suggest that fifth metatarsal head resection is a potentially effective treatment in patients at high risk of ulceration and reulceration. (J Am Podiatr Med Assoc 95(4): 353-356, 2005)

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Methods

This retrospective cohort study evaluated 40 patients with diabetes mellitus (mean ± SD age, 65 ± 8.7 years). Patients whose data were abstracted met the following criteria: 1) a diagnosis of diabetes mellitus by their primary-care provider, 2) neuropathic ulceration on the plantar aspect of the fifth metatarsal head, and 3) the ability to walk unassisted. The study protocol was reviewed by the institutional review boards of both the University of Arizona and the Department of Veterans Affairs; it was classified as “exempt,” as no unique patient identifiers were used.

Patients were followed for 6 months. All ulcers were classified using the University of Texas wound classification system and were identified as either 1A or 2A (ulcerations did not probe to bone, and none had concomitant infection or ischemia). Data were collected during a 4-year period for patients who had fifth metatarsal ulcerations. During that time, 22 patients who met the criteria described in the previous paragraph received surgical intervention. These patients were compared with 18 control subjects who received standard wound care that consisted of wound dressing changes, aggressive off-loading, and weekly debridement.

Vascular status was evaluated by pedal pulse palpation. The diagnosis of ischemia was standardized in the facility where data were abstracted and was made by the absence of more than one foot pulse or a nonaudible signal on Doppler ultrasonography of the dorsalis pedis or posterior tibial pulses in the affected extremity. This method of evaluation, although arguably not as sensitive as other noninvasive methods, such as transcutaneous oximetry, segmental extremity pressure studies, or laser Doppler flowmetry, has the benefit of having been performed systematically on all of the patients in this study.

All procedures performed fell into diabetic foot surgery class 3 (curative) using the classification described by Armstrong and Frykberg. The fifth metatarsal head resections were performed by one of two attending surgeons. The technique, which was standardized, consisted of an approach through a dorsolateral incision that extended from the distal onethird of the fifth metatarsal to the proximal one-third of the base of the proximal phalanx. The metatarsal head was exposed and resected at the surgical neck, thus eliminating the source of pressure responsible for the ulceration. All procedures were performed with the patient under sedation, with local anesthetic infiltrated regionally. Postoperative care for all patients was similar, consisting of standardized removable cast walker off-loading (DH Walker; Royce Medical, Camarillo, California). Patients were followed on a weekly basis. At approximately 2 weeks, the surgical patients had their sutures removed. All plantar ulcers were debrided of nonviable tissue at each visit until wound healing.

Healing was defined as complete epithelialization over the former defect. When the ulcer sites were clinically healed, patients were placed in depth inlay shoes with multidurometer, multilaminar inlays. These patients were followed monthly, as is the protocol for patients in international diabetic foot risk category 3.

All data are reported as mean ± SD. For all analyses of continuous data, we used a t-test. For dichotomous analyses, we used a χ² test with 95% confidence intervals (CIs) and odds ratios. The α was set at 5% for all assessments.

Results

Descriptive statistics for this population are given in Table 1. There were no significant differences between the two groups in age (P = .5), duration of diabetes mellitus (P = .4), level of glycated hemoglobin (P = .9), or sex (P = .9). Individuals who underwent fifth metatarsal head resection healed significantly sooner than those who received nonsurgical therapy only (5.8 ± 2.9 versus 8.7 ± 4.3 weeks; P = .02) (Fig. 1). Significantly fewer patients reulcerated during the 6-month follow-up after resection of the fifth metatarsal head (4.5% versus 27.8%; P = .04; odds ratio, 8.3; 95% CI, 1.1–76.9).

All of the patients who were treated conservatively and who had recurrent ulcerations did so at the plantar aspect of the fifth metatarsophalangeal joint. No significant differences were found in percentage of patients diagnosed as having an infection during follow-up (18.2% versus 22.2%; P = .8) or in percentage of patients who underwent amputation (4.5% versus 11.7%; P = .4).

Discussion

The results of this study suggest that isolated fifth metatarsal head resection may be associated with a shorter time to healing and a reduced risk of recurrence of diabetic foot ulceration. Although other studies in the literature have evaluated generalized outcomes of metatarsal head resection, none has specifically focused on a single anatomical site. We contend that peak plantar pressures and the time that these pressures are applied in gait are different on different parts of the forefoot. Therefore, it would be prudent for the surgeon to critically evaluate out-
comes in discrete anatomical sites because the outcomes (and therefore the efficacy) of these procedures could be expected to vary based on site.

A recent report by Wieman et al.14 documented an 11-year retrospective study that evaluated 101 patients with diabetic foot ulcers. All of the patients were treated with surgical resection of the prominent metatarsal head to facilitate wound closure. In this study, 88% of the ulcers healed. Although they evaluated a relatively large number of patients, outcomes were spread across all metatarsal heads, thereby limiting the analytic power and therefore the ultimate conclusions drawn from the data for any specific anatomical site.

A logical question that might arise and a standard problem with any case-controlled study of surgical outcomes involves the criteria at a single center for one patient to have surgical intervention and the other to undergo conservative treatment. The rational explanation of this query is the difference in philosophy between the two attending surgeons, both similarly trained, who managed the clinic. During the period of review, one favored a primarily surgical approach to this type of deformity and the other a primarily nonsurgical approach.

Conclusion
Fifth metatarsal head resection is a potentially safe and efficacious procedure that can be used to facilitate wound closure in patients with chronic or recurrent neuropathic ulcerations. The surgical technique is relatively basic, with very few apparent complications. We believe that this surgical procedure should be considered as a therapeutic option in appropriately selected patients.

References


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Table 1. Descriptive Characteristics of the Study Population

<table>
<thead>
<tr>
<th></th>
<th>Fifth Metatarsal Head Resection Group (n = 22)</th>
<th>Control Group (n = 18)</th>
<th>Total (N = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD (years)</td>
<td>65 ± 9.0</td>
<td>64 ± 7.7</td>
<td>65.1 ± 8.7</td>
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<td>Wound size, mean ± SD (cm²)</td>
<td>2.3 ± 1.4</td>
<td>2.6 ± 1.6</td>
<td>2.4 ± 1.5</td>
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<td>Sex (% male)</td>
<td>81.8</td>
<td>83.3</td>
<td>82.5</td>
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<td>Glycosylated hemoglobin, mean ± SD (%)</td>
<td>8.3 ± 1.6</td>
<td>8.4 ± 1.6</td>
<td>8.4 ± 0.6</td>
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<tr>
<td>Duration of diabetes mellitus, mean ± SD (years)</td>
<td>13.7 ± 4.9</td>
<td>12.4 ± 5.5</td>
<td>13.1 ± 5.2</td>
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<tr>
<td>Time to heal, mean ± SD (weeks)</td>
<td>5.8 ± 2.9*</td>
<td>8.7 ± 4.3</td>
<td>7.2 ± 3.6</td>
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<tr>
<td>Recurrence at 6 months (%)</td>
<td>4.5*</td>
<td>27.8</td>
<td>15.0</td>
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*P < .05.
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