Early Results of the Mau Osteotomy for Correction of Moderate to Severe Hallux Valgus: A Review of 24 Cases

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In our retrospective study, we report the objective results of the Mau osteotomy in the treatment of hallux valgus. We reviewed the results of 24 cases of moderate to severe hallux valgus deformities corrected with the Mau osteotomy of the first metatarsal combined with a distal soft-tissue procedure. Follow-up was possible in 24 cases. Preoperatively the mean hallux valgus and first intermetatarsal angles were 31.3° and 16.6° respectively, and were corrected postoperatively to an average of 13.00° ± 7.15° and 9.80° ± 2.43° respectively (P < .001). In the sagittal plane, the first metatarsal was shortened by an average of 2.00 mm. Two (8.3%) cases had dorsal elevation of the osteotomy fragment. Complications included 3 recurrences of the deformity, 1 frank nonunion, 8 dorsal cortical nonunions, 5 cases of undercorrection, and 1 case of broken hardware that was present in the nonunion that went on to revision. There were no superficial or deep infections, and no cases of transfer metatarsalgia were noted. In this series, the use of an oblique first metatarsal osteotomy with a dorsal shelf resulted in reliable and powerful correction of the first intermetatarsal angle in patients with moderate to severe hallux valgus. Particular attention should be paid to severe IM angles and the possibility of undercorrections. Despite ambulation postoperatively, the Mau osteotomy minimized dorsal malunion and the incidence of transfer metatarsalgia. Level of Clinical Evidence: 4. (The Journal of Foot & Ankle Surgery 47(3):237–242, 2008)

Key Words: bunionectomy, first metatarsal, hallux valgus, Mau osteotomy

Metatarsal osteotomies are commonly used in correction of hallux abductovalgus deformities (HAV). Numerous surgical procedures have been described to correct this deformity and the choice of surgery depends on the severity and location of the pathology (1). It is also known that HAV deformities with a moderate to severe increase in the first intermetatarsal angle (IM angle >15°) often require a proximal first metatarsal osteotomy for adequate correction (2). Several proximal osteotomies have been reported with good clinical results such as the proximal chevron, closing and opening base wedge osteotomies, and Ludloff (3–8). These osteotomies are also associated with delayed bone healing and transfer metatarsalgia due to either dorsal malunion or shortening (4, 5, 7).

In 1926, Mau described a through-and-through osteotomy in the transverse plane extending plantar-proximal to distal-dorsal when viewed in the sagittal plane (9). Mau challenged the stability of the Ludloff osteotomy and created the dorsal shelf to help resist weight-bearing forces (10, 11). The Ludloff is a transverse through-and-through osteotomy from dorsal-proximal to plantar-distal without a dorsal shelf. Originally fixation was not applied and therefore abandoned for decades. Now with advances in fixation, these osteotomies have proven to be stable and are gaining more popularity (11, 12). This osteotomy has superior intrinsic stability because of the dorsal shelf that resists dorsal displacement forces (6, 11, 13). Others have suggested that the Mau osteotomy be reserved for mild deformities due to its limited corrective ability because of its location and geometry; and it has been criticized for having an axis of motion that is too distal and one that limits the possibility for angular correction (1, 6). Biomechanical studies have shown superior advantages offered by the oblique shaft osteotomies and may lower the incidence of transfer lesions and other complications associated with other proximal osteotomies (7, 8, 11, 12). The primary aim of this retrospective study was to determine the radiographic

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improvement of a moderate to severe HAV deformity using the Mau osteotomy. The second objective was to determine the complications of the Mau osteotomy.

Patients and Methods

We retrospectively reviewed the results of 24 patients who underwent a Mau osteotomy with a distal soft tissue release, between October 2003 and March 2005. Patients were chosen based on specific inclusion and exclusion criteria from the senior authors' outpatient clinics. The surgical inclusion criteria included age (older than 18 years), a painful moderate to severe hallux valgus with metatarsus primus varus (intermetatarsal [IM] angle >13°) that was unresponsive to conservative shoe wear. Specific exclusion criteria included diabetes, smoking, and significant radiographic degenerative changes at the metatarsophalangeal joint. A painful deformity was defined objectively by irritation of shoe wear over the prominent medial eminence. Objective data such as the need for revision surgery, the presence of a transfer lesion, and length of follow-up were obtained from a chart review performed by 1 of the authors (J.G). All measurements were performed by the same 2 authors by dividing the records and radiographs evenly and reviewing them independently.

Radiography

Pre- and postoperative anteroposterior (AP) and lateral radiographs of the feet were made with the patient in the weight-bearing position. Data recorded on each group from the pre- and postoperative AP radiographs included the following: the IM 1–2 angle, HAV angle, nonunion, recurrence of deformity, and the length of the first metatarsal. The IM 1–2 angle was determined by measuring the angle subtended by the lines bisecting the longitudinal axis of the first and second metatarsals. The hallux valgus angle was determined by measuring the angle subtended by the lines bisecting the first metatarsal and proximal phalanx of the hallux. The length of the first metatarsal was determined on the AP view and measured by a line from the head of the metatarsal to the proximal base of the first metatarsal. Dorsal elevation was determined on the lateral view by bisecting the first metatarsal in the mid-diaphyseal region on the lateral weight-bearing radiograph. If the mid-diaphyseal line was above the dorsal cortical line of the second metatarsal, then dorsal elevation was established. Nonunion was determined from the lateral and AP radiographs. All measurements were obtained by measuring once and recorded by 2 authors (J.G. and C.H.).

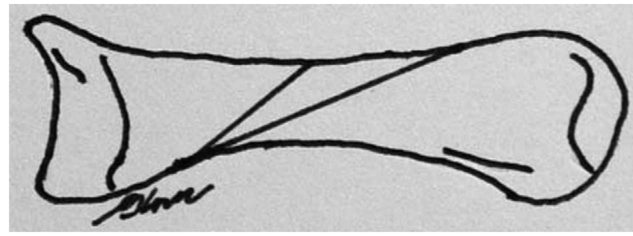

FIGURE 1 The traditional Mau osteotomy (*more distal line*) and the slight modification (*most proximal line*).

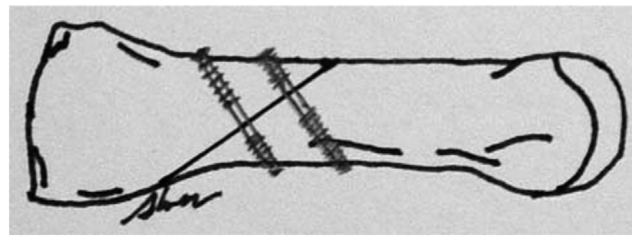

FIGURE 2 The modified Mau osteotomy with 2-screw fixation.

Operative Technique

The Mau bunionectomies were performed to a technique similar to that previously described with slight modifications (10, 11). First, a medial inverted L-capsulotomy was performed using a standard medial approach. A separate incision was placed over the first webspace and the transmetatarsal ligament and adductor hallucis, including its attachment to the fibular sesamoid, were released. The lateral capsule of the first metatarsophalangeal joint (MTPJ) was "pie crusted" and a varus stress was applied to the joint. Thereafter, the proximal aspect of the first metatarsal was approached through a 3-cm longitudinal dorsomedial incision and, after identifying the tarsometatarsal joint (TMTJ), an oblique osteotomy, situated 1 cm distal to the TMTJ, was made medially from plantar-proximal to dorsal-distal, parallel to the weight-bearing surface using a power saw. The osteotomy terminated just distal to the metaphyseal region of the first metatarsal and did not involve the full length of the shaft as in the traditional Mau osteotomy (Figure 1). The distal fragment was then rotated and realigned to produce an IM angle less than 9°, after which a bone clamp was used to temporarily stabilize the osteotomy. Then, two 0.025-inch Kirschner wires (K-wires) were placed dorsal to plantar, perpendicular to the osteotomy, and two 2.7- or 3.0-mm cannulated lag screws were used to permanently stabilize the osseous fragments (Figure 2). After the metatarsus varus was corrected, medial capsulorrhaphy and sesamoid realignment were undertaken. Figure 3 shows pre- and postoperative AP and lateral radiographs of a Mau bunionectomy.