Proximal Oblique Crescentic Osteotomy in Hallux Valgus

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Twenty-six patients with moderate-to-severe hallux valgus deformities were evaluated before and after treatment. All of the patients had incongruent great toe joints. The patients underwent modified proximal crescentic osteotomy, which was termed proximal oblique crescentic osteotomy. The results were evaluated at an average follow-up time of 55 weeks. Objective criteria were hallux valgus angle, intermetatarsal angle, shortening of the first metatarsal, and angulation at the osteotomy site. Clinical evaluation was made according to the rating system of the American Orthopaedic Foot and Ankle Society. The mean correction of the hallux valgus and intermetatarsal angles was 22.1° and 9.9°, respectively. Short-term results indicate that proximal oblique crescentic osteotomy is effective in the treatment of hallux valgus; its advantages over other procedures include its technical ease and low rate of complications. (J Am Podiatr Med Assoc 94(1): 43-46, 2004)

Hallux valgus is one of the most common foot deformities in populations that wear Western-style shoes, and it is more prevalent in women than in men. Besides shoe style, factors such as the structure of the foot, genetic and neuromuscular disorders, and systemic diseases may also lead to a hallux valgus deformity.[1]

The pathologic anatomy of hallux valgus is complex and consists mainly of bunion formation over the medial eminence, pronation and lateral deviation of the proximal phalanx, elongation of the metatarsophalangeal joint capsule at the medial aspect and contraction at the lateral side, lateral deviation of the sesamoid bones, and medial deviation of the first metatarsal (metatarsus primus varus).[1-3] Hallux valgus deformities fall into two groups. The first group is categorized according to the situation of the proximal phalanx on the head of the first metatarsal: congruent (not subluxated), incongruent (subluxated), and characterized by a joint with degenerative arthritis. The second group is categorized according to the hallux valgus and intermetatarsal angles, respectively: mild (<30° and <15°), moderate (30° to 40° and 15° to 20°), and severe (>40° and >20°).[1, 4] Proximal metatarsal osteotomy combined with a distal soft-tissue procedure is recommended in patients who have moderate-to-severe hallux valgus because metatarsus primus varus is the main pathology in those patients.[3-7] The most common proximal metatarsal osteotomies performed to correct metatarsus primus varus are proximal closing wedge osteotomy, proximal crescentic osteotomy, crescentic shelf osteotomy, and proximal chevron osteotomy.[1, 3, 4, 6] In the present study, we modified the proximal crescentic osteotomy by forming an oblique osteotomy line instead of a vertical osteotomy line; we termed the modified procedure proximal oblique crescentic osteotomy. The intention was to overcome the shortening of the first metatarsal with crescentic osteotomy,

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while the oblique osteotomy diminished the chance of iatrogenic metatarsal elevation and penetration of the metatarsocuneiform joint by the osteotomy-fixating screw.

Materials and Methods

Twenty-six patients with moderate-to-severe hallux valgus deformities with incongruent joints were treated with a combination of a distal soft-tissue procedure and proximal oblique crescentic osteotomy. Indications for surgery were persistent pain in the first metatarsophalangeal joint, discomfort with wearing shoes, and pressure of the hallux on the second toe.

Hallux valgus angle, intermetatarsal angle, congruency of the first metatarsophalangeal joint, and length of the first metatarsal in relation to the second metatarsal were evaluated on the preoperative weightbearing lateral and anteroposterior radiographs. All of the patients who underwent surgical treatment and were included in this study had an incongruent metatarsophalangeal joint without degenerative changes. According to angular measurements, 21 patients (81%) were considered to have moderate deformity, and the remaining patients had severe deformity. The average hallux valgus angle was 34.1° (range, 25° to 45°), and the average intermetatarsal angle was 18.4° (range, 15° to 24°).

The distal soft-tissue procedure was performed with two incisions: first, a dorsal longitudinal incision was made in the first distal intermetatarsal space, where the authors performed adductor tenotomy and lateral capsular release; second, a medial longitudinal incision was made at the medial side of the metatarsophalangeal joint, where we performed bunionectomy.

Osteotomy was performed with a dorsomedial longitudinal incision over the first metatarsal beginning at the metatarsocuneiform joint for approximately 3.0 cm distally. Blunt dissection was carried down to the first metatarsocuneiform joint, and the proximal metatarsal was exposed. A curved blade that was oriented in the plantar distal direction with an angle of 45° to the long axis of the metatarsal was used to perform proximal oblique crescentic osteotomy, beginning approximately 0.5 to 1.0 cm distal to the metatarsocuneiform joint on the dorsum of the first metatarsal. The concavity of the osteotomy was directed distally. After the osteotomy was completed, the first metatarsal head was moved closer to the second to obtain 2- to 4-mm medialization of the distal fragment at the site of the osteotomy. After proper medialization of the distal fragment, the osteotomy was fixated with a 3.5-mm cortical screw directed from the distal dorsal aspect through the proximal plantar aspect at a nearly right angle to the osteotomy line. We were careful not to cause dorsiflexion deformity at the distal fragment while fixating the osteotomy. The oblique shelf of the proximal fragment allows vertical placement of the screw with respect to the osteotomy line, decreasing the chance of penetration of the metatarsocuneiform joint (Fig. 1).

Fixation of the osteotomy was followed by distal medial capsuloplasty. The great toe was held in a slightly overcorrected position while the medial capsule was reapproximated with interrupted sutures. After skin closure, a well-padded compression dressing was applied to hold the hallux in its corrected position. Postoperatively, a stiff shoe was used for immediate weightbearing as tolerated by the patient. Full weightbearing was permitted after solid union of the osteotomy was established. Because none of the patients had screw fixation crossing the metatarsocuneiform joint, we did not routinely remove the screw except in those who felt pain on the dorsum of the first metatarsal while wearing shoes.

Results were evaluated according to the clinical and radiographic findings. In the radiographic evaluation, we determined the hallux valgus and intermetatarsal angles, the length of the first metatarsal in relation to the second metatarsal, the dorsal angulation of the metatarsal head, and the degenerative changes in the metatarsophalangeal and metatarsocuneiform joints on the weightbearing anteroposteri-

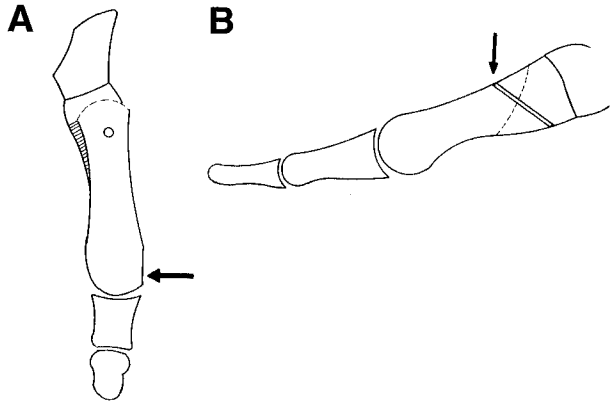

Figure 1. In proximal oblique crescentic osteotomy, a plantar shelf is created under the proximal metatarsal with the crescentic blade directed at an angle of 45° to the long axis of the first metatarsal. After medialization of the metatarsal head (large arrow on the anteroposterior plane) (A), screw fixation is achieved at an angle of nearly 90° to the line of osteotomy (small arrow on the lateral plane) (B).

or and lateral radiographs at the last follow-up visit. In the clinical evaluation, we used the rating system developed by the American Orthopaedic Foot and Ankle Society to assess the state of the foot preoperatively and at the last follow-up visit.[8]

Results

Average follow-up time was 55 weeks (range, 46 to 67 weeks). Full weightbearing was allowed after solid union was seen at the osteotomy site on plain film radiographs, at an average of 7 weeks after surgery.

The mean correction of the hallux valgus and intermetatarsal angles was 22.1° and 9.9°, respectively. The average preoperative hallux valgus angle was 34.1°, and it was reduced to 12° (range, 4° to 17°). The average preoperative intermetatarsal angle was 18.4°, and it was reduced to 8.5° (range, 2° to 15°). On weightbearing anteroposterior and lateral radiographs, average shortening of the first metatarsal was 3.0 mm (range, 2.0 to 5.0 mm) (n = 4 [15.4%]), and there was only one foot (3.8%) that had minimal angulation at the osteotomy site, causing dorsiflexion deformity of the metatarsal head. None of the patients who had shortening and dorsiflexion deformity presented with transfer metatarsalgia. There were no degenerative changes in the metatarsophalangeal and metatarsocuneiform joints.

According to the American Orthopaedic Foot and Ankle Society clinical rating system, 40 points were assigned to pain, 45 to function, and 15 to alignment, with a maximum score of 100 points possible for a patient with no restriction of motion, no instability, good alignment, no pain in daily or recreational activities, and no footwear limitations. The preoperative and postoperative average scores, respectively, were 14.6 and 29.6 for pain, 33.0 and 39.2 for function, 0 and 13.4 for alignment, and 47.6 and 82.2 overall. All of the patients reported subjective satisfaction with the surgical procedure compared with the preoperative state of their feet.

The patients did not experience any complications, including nonunion at the osteotomy site, avascular necrosis of the metatarsal head, and superficial and deep infections.

Discussion

Surgical techniques that have been described in the treatment of moderate-to-severe hallux valgus are not adequate to correct all of the pathologies of this complex deformity when they are performed separately.[1-3] Therefore, the combination of a distal soft-tissue procedure and osteotomy of the first metatarsal is frequently performed to obtain satisfactory results. Although the soft-tissue procedure is usually performed in a standardized manner, the technique and level of the metatarsal osteotomy are somewhat controversial.[1-4, 9] Proximal metatarsal osteotomies are recommended for moderate-to-severe hallux valgus in which metatarsus primus varus is the main deformity.[1, 3, 9] One of the most common complications of proximal metatarsal osteotomies is the transfer metatarsalgia that develops as a result of the shortening of the first metatarsal or fixation of the distal metatarsal in relative dorsiflexion.[2, 4, 5, 10, 11] The proximal closing wedge osteotomy has the highest risk of shortening of the first metatarsal and elevation of the metatarsal head, which might cause transfer metatarsalgia. The proximal chevron osteotomy is not a frequently used technique.[4, 6] The most popular and frequently used proximal osteotomy is the crescentic osteotomy. Crescent-shaped osteotomy provides triplanar correction for any degree of metatarsus primus varus, with a lower incidence of metatarsal head elevation and shortening of the metatarsal.[2-4, 6]

The results of the present study were compared with those reported in the literature for proximal crescentic osteotomy combined with a distal soft-tissue procedure. In the present study, the hallux valgus and intermetatarsal angles were reduced an average of 22.1° and 9.9°, respectively, the mean amount of shortening of the first metatarsal was 3.0 mm (range, 2.0 to 5.0 mm), and there was only one foot (3.8%) with a dorsiflexion deformity of the metatarsal head. Mann et al[2] reported the following results in 109 feet (75 patients): average correction of 21° in the hallux valgus angle and 8° in the intermetatarsal angle, mean shortening of 2.0 mm, and the presence of dorsiflexion deformity in 21 patients (28%). Zettl et al[4] reported the following results in 70 patients (86 feet): average correction of 26.5° in the hallux valgus angle and 10° in the intermetatarsal angle, mean metatarsal shortening of 3.0 mm, and the presence of dorsiflexion deformity in eight feet (9%). The values obtained in the present study for the average correction of the hallux valgus and intermetatarsal angles and the mean shortening of the first metatarsal are similar to the results reported in the literature. However, there was a lower rate of dorsiflexion deformity of the metatarsal head in the present study.

In the present study, a distal soft-tissue procedure was performed in combination with a modification of proximal crescentic osteotomy, which was named proximal oblique crescentic osteotomy. Two major drawbacks of the proximal crescentic osteotomy are the risks of metatarsal head elevation while fixating

the osteotomy, which has the subsequent risk of transfer metatarsalgia, and transarticular placement of the fixation screw into the metatarsocuneiform joint, which might cause arthritis and requires removal of the screw before full weightbearing.[2-4] We aimed to overcome these drawbacks by using proximal oblique crescentic osteotomy. With the proximal oblique crescentic osteotomy, more vertical screw fixation was possible to avoid transarticular fixation into the metatarsocuneiform joint, and an oblique shelf at the proximal plantar aspect of the osteotomy helped control metatarsal head elevation.

Proximal oblique crescentic osteotomy is similar to crescentic shelf osteotomy (Fig. 2), but, in our opinion, proximal oblique crescentic osteotomy has some advantages. First, it is technically easier. Second, it requires a shorter incision; thus the chance of disruption of the nutrient artery supply, which has a subsequent risk of avascular necrosis of the distal metatarsal, diminishes. Third, proximal oblique crescentic osteotomy has the advantage of triplanar correction, like proximal crescentic osteotomy, whereas crescentic shelf osteotomy provides biplanar correction.[3, 12]

Although the short-term clinical and radiographic results of patients who were treated with proximal oblique crescentic osteotomy were reported, the major aim of our study was to offer an alternative for the surgical treatment of metatarsus primus varus deformity.

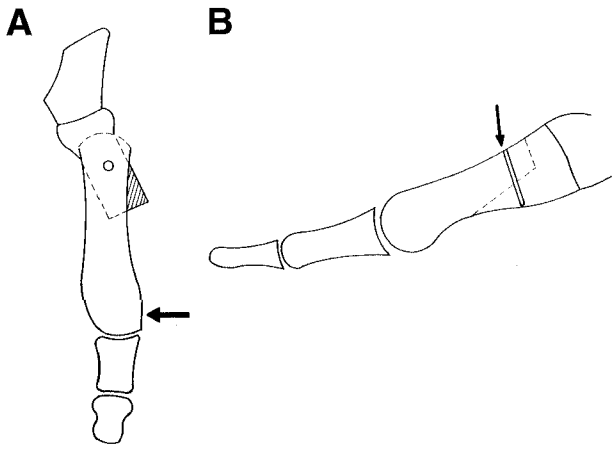

Figure 2. In crescentic shelf osteotomy, crescentic osteotomy is performed with a crescentic blade halfway through the bone, and a plantar shelf is created using a sagittal saw. After medialization of the metatarsal head (large arrow on the anteroposterior plane) (A), screw fixation is achieved at an angle of nearly 90° to the metatarsal shaft (small arrow on the lateral plane) (B).

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