Adding Stability to the Crescentic Basilar First Metatarsal Osteotomy

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Crescentic basilar osteotomies for metatarsus primus varus and hallux valgus allow for substantial correction of the first intermetatarsal angle and the hallux valgus angle. Crescentic osteotomies have two well-documented pitfalls: sagittal plane instability and difficulty in fixation. We describe the addition of a plantar shelf to crescentic basilar osteotomy that allows for easier fixation and less risk of elevation of the first metatarsal postoperatively. This plantar shelf is made in the metaphyseal portion of the first metatarsal, which provides the benefit of better bone healing. In 20 patients, we found an average reduction in the intermetatarsal angle of 9.3° and an average reduction in the hallux valgus angle of 21.8°. Eight weeks postoperatively, only one patient showed elevation of the first metatarsal. (J Am Podiatr Med Assoc 94(5): 502-504, 2004)

Basilar first metatarsal osteotomies have been described by several authors for correction of severe metatarsus primus varus, including opening wedge, closing wedge, oblique, and crescentic types. Basilar osteotomies are preferred in cases of severe deformity because of the increased lever arm of correction. Generally, basilar osteotomies are used for intermetatarsal angles greater than 14° to 16°.[1-3] Mann et al[4] popularized the crescentic osteotomy for severe metatarsus primus varus and hallux valgus.

Basilar osteotomies share two common pitfalls: sagittal plane instability (leading to displacement) and difficulty in fixation. Mann et al[4] noted dorsiflexion with crescentic osteotomies in 28% of their patients. Thordarson and Leventen[5] noted an average of 6.2° of dorsiflexion through crescentic osteotomies. Fillinger et al[6] noted dorsiflexion of the distal metatarsal in all basilar osteotomies in their study. Schuberth et al[7] found postoperative elevation in 93.7% of their patients undergoing closing base wedge osteotomy (average elevation, 6.7°). Lian et al[8] compared different fixation modalities for basilar first metatarsal osteotomies and found that screw fixation was the strongest regardless of osteotomy type. Cannulated screw systems have reduced the technical demands of placing fixation but have decreased tolerated shear force, pullout strength, and insertion torque compared with noncannulated screws.[9] First metatarsal shortening is also a problem with basilar osteotomies, but this shortening has been found to be only 1 mm with the crescentic type.[10] Crescentic osteotomies have been described with the concave surface facing both proximally and distally. Several authors advocate having the convex surface face distally to dissipate the retrograde deforming forces at the osteotomy site (Roger Mann, MD, personal communication, 2001). We agree with this theory and have oriented our osteotomy with the convex surface facing distally. We describe a modification to the crescentic osteotomy that allows easier fixation and reduces the risk of dorsiflexion of the distal metatarsal.

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Materials and Methods

The crescentic osteotomy is made 1.5 to 2.0 cm distal to the metatarsocuneiform joint, dorsal to plantar, perpendicular to the ground to prevent any displacement in the sagittal plane (dorsiflexion), with reduction of the intermetatarsal angle. Using our technique, before performing this osteotomy, the surgeon creates a plantar shelf from a medial to lateral direction that is made as close to parallel as possible to the weightbearing surface with an oscillating saw. This plantar shelf exits the metatarsal proximal to the planned placement of the crescentic osteotomy and distal to the first metatarsocuneiform joint. After this shelf is completed, the crescentic blade is used to create the osteotomy in the superior two-thirds of the metatarsal. Lateral translation of the distal metatarsal is performed while pulling medially on the proximal metatarsal with a bone hook or sharp retractor. Once reduction of the intermetatarsal angle is achieved, the first point of temporary fixation is with a 2-mm Kirschner wire inserted from dorsal proximal to plantar distal across the osteotomy site. This wire is directed approximately 45° from the weightbearing surface. The second point of temporary fixation is distal to the osteotomy site, with another 2-mm Kirschner wire inserted from the medial cortex of the first metatarsal shaft into the second metatarsal shaft. The first Kirschner wire is then removed, and a bicortical 3.5-mm solid screw is inserted along its path using appropriate AO technique (Figs. 1 and 2).[11] Before final tightening of the 3.5-mm cortical screw, the second Kirschner wire is removed. After reduction of the intermetatarsal angle, any distal procedures are then performed as necessary.

Postoperative care consists of a short-leg posterior splint and nonweightbearing for 2 weeks, at which time sutures are removed. After suture removal, patients are placed in a short-leg nonweightbearing cast for 3 weeks. After removal of the cast, patients are allowed to begin partial weightbearing 5 weeks postoperatively. At 6 weeks postoperatively, patients are fully weightbearing.

Results

In a review of 20 crescentic osteotomies using our technique, we found an average reduction in the intermetatarsal angle of 9.3° (range, 6° to 13°) and an average reduction in the hallux valgus angle of 21.8° (range, 12° to 30°). Radiographic evaluation 8 weeks postoperatively showed elevation of the first metatarsal in only one case. No failure of hardware or loss of reduction was identified. All patients were weightbearing 8 weeks postoperatively; minimal to no bony callus formation was seen with trabecular patterns across the osteotomy site.

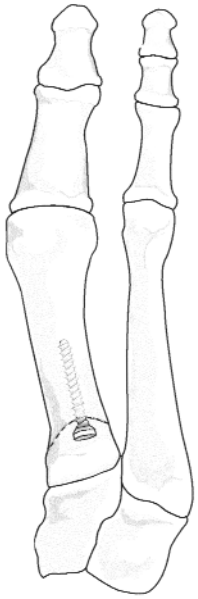

Figure 1. Dorsoplantar view showing the orientation of the osteotomy (broken line) with fixation.

Conclusion

A new basilar shelf osteotomy for the correction of metatarsus primus varus or hallux valgus has been described. Our technique uses a shelf that exits proximal to the crescentic osteotomy, in contrast to the shelf previously described by Cohen et al,[12] which

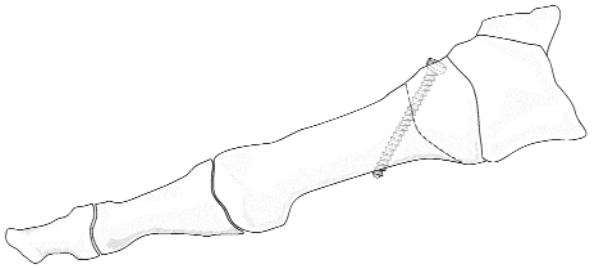

Figure 2. Lateral view showing the orientation of the osteotomy (broken line) with fixation. The plantar osteotomy is made as parallel as possible to the weightbearing surface without compromising the metatarsocuneiform joint.

exits distal to the crescentic osteotomy. Our modification minimizes the usual complications of the crescentic osteotomy: postoperative elevation of the metatarsal and difficulty in fixation. Because the shelf exits proximally into metaphyseal bone in our modification, healing is likely to be better than with a shelf that extends distally into diaphyseal bone. We had only one case of displacement of the metatarsal in the sagittal plane. This osteotomy also allows for ease of bicortical fixation with standard screws. In our limited study, we did not have failure of fixation or loss of correction.

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