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Phalangeal Osteotomy for Hallux Valgus

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Adequate correction of hallux valgus may be attempted at various levels of the first ray complex, depending on appropriate determination of the apex of the deformity. Methods of correction may include first metatarsal base osteotomy and first metatarsal head osteotomy as well as uncomplicated first metatarsophalangeal joint soft tissue realignment. In those instances in which the major deformity lies distal to the first metatarsophalangeal joint, however, phalangeal osteotomy is well suited as the procedure of choice. The purpose of this chapter is to outline the role of osteotomy of the proximal phalanx of the hallux, the Akin-type procedure, in the correction of hallux valgus.

HISTORICAL BACKGROUND

In 1925, Dr. O.F. Akin¹ described a procedure that included resection of the medial exostosis of the first metatarsal head and a portion of the base of the proximal phalanx. This was followed by a "cuneiform-shaped osteotomy" into the proximal phalangeal base, with inward rotation of the toe to straighten the hallux (Fig. 8-1). More than 40 years later, Colloff and Weitz² suggested that a major benefit of the Akin-type procedure is the ability to correct a mild to moderate deformity without disturbing the congruity and soft tissue relationships of the first metatarsophalangeal joint. Preoperative range of motion is then easily preserved. It was also suggested that this procedure would be inappropriate in cases involving "severe metatarsus primus varus, hallux rigidus and rheumatoid arthritis".²

A plethora of articles have subsequently described with various aspects of the Akin procedure. Most of these have addressed the indications for the procedure, as well as variations on placement, shape, and fixation of the actual osteotomy. For instance, osteotomy of the proximal phalangeal base, the original procedure presented by Dr. Akin, has been proposed as a correction for an abnormal distal articular set angle (DASA) (Fig. 8-2) while osteotomy in the distal metaphysis will predictably correct for an abnormal hallux abductus interphalangeus (HAI)³⁻⁵ (Fig. 8-3). An excessively long proximal phalanx may be shortened quite nicely using a cylindrical variation of the Akin osteotomy.⁶ Additionally, use of the Akin procedure as an adjunctive procedure has been given considerable discussion, most recently as combined with the Chevron-type osteotomy of the first metatarsal head.^{7,8}

Discussions regarding fixation of the osteotomy have included descriptions of splinting, Kirschner wire utilization, and monofilament wire and internal screw fixation^{9,10} (Fig. 8-4). It becomes readily apparent from a review of the literature, however, that utilization of the Akin-type procedure as primary and sole correction of hallux valgus deformity is rarely appropriate. Phalangeal osteotomy appears to be most useful as an adjunctive procedure that can complement toe correction provided by a closing base wedge osteotomy, distal metaphyseal osteotomy, or McBride-type unionectomy, when such a procedure is used to correct a more proximal deformity.^{2,7,11} Figure 8-5 demonstrates several applications of the Akin osteotomy of the hallux.

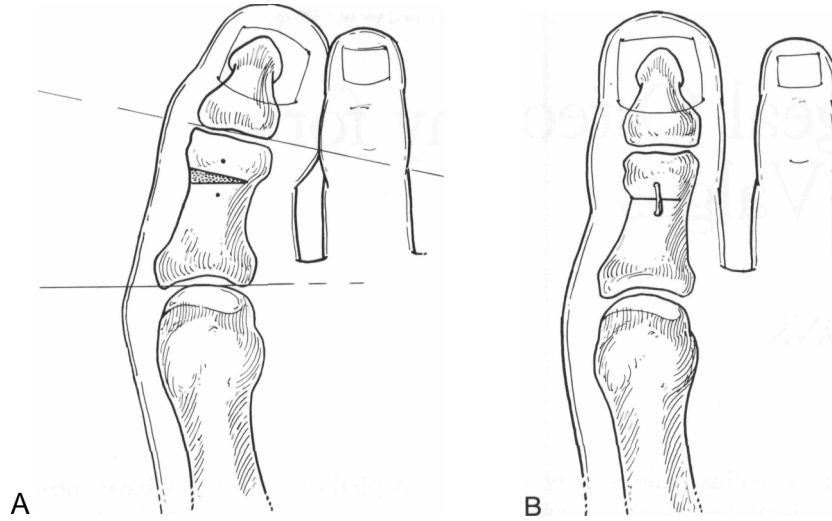


Fig. 8-1. (A & B) The original Akin procedure.

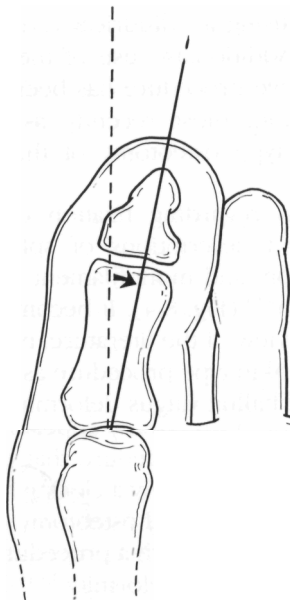


Fig. 8-2. Distal articular set angle (now greater than 8°).

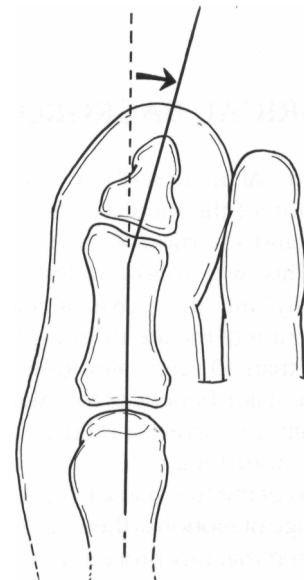


Fig. 8-3. Hallux abductus interphalangeus.

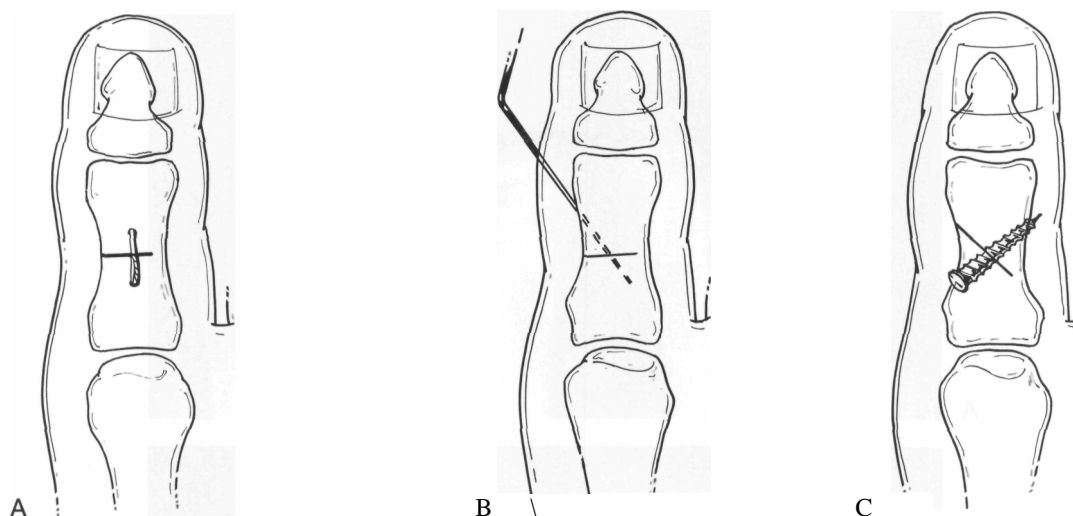


Fig. 8-4. Types of fixation. (A) Wire; (B) Kirschner wire; (C) screw

PROXIMAL AKIN PROCEDURE

The traditional Akin osteotomy is described as a transverse closing wedge osteotomy, performed approximately 5 mm. distal to the articular surface of the base of the proximal phalanx (Fig. 8-6).

The first osteotomy is performed parallel to the phalangeal base and the second osteotomy is positioned parallel to the articular surface of the phalangeal head. On removal of the intervening osseous wedge and reduction of the osteotomy, symmetry of the medial and lateral aspects of the phalangeal shaft has been achieved.^{1,5,12-14}

Although a painful hallux, often with accompanying pressure against the second digit, is usually the chief complaint, certain preoperative criteria will lead the practitioner to selection of the phalangeal osteotomy. According to Gerbert,¹⁴ these criteria would include hallux abductus (with or without bunion deformity), a minimum valgus rotation of the hallux, and adequate first metatarsophalangeal joint range of motion without crepitus.

Radiographic examination should also be carried out. The following findings may signal the need for phalangeal correction: an incongruous first metatarsophalangeal joint must first be corrected by an additional procedure; adequate phalangeal length must be

present; the metatarsus primus adductus angle must be normal; an abnormal DASA (usually greater than 8°) is present; and the HIA should be normal.¹⁴

It should be noted, however, that radiographic evaluation of the hallux may be somewhat deceiving and may erroneously suggest the need for an Akin procedure. For example, evaluation of a standard weight-bearing dorsoplantar radiograph may demonstrate an excessively high DASA, hinting that the deformity should be corrected at the phalangeal base. However, care must be taken to ensure that excessive valgus rotation of the hallux is not present, causing the illusion of an asymmetric proximal phalanx. Soft tissue realignment at the metatarsophalangeal joint may very likely derotate the frontal plane deformity and eliminate the need for phalangeal osteotomy.

Preoperative planning is helpful in predicting the amount of bone to be removed. Gerbert¹⁴ has vigorously advocated the use of templates fashioned to preoperative radiographs, and this topic was given further consideration by Gohil and Cavolo.¹⁵ Frey et al.¹¹ have published an elaborate mathematical analysis for the prediction of correction necessary. Regardless of the method employed, rectus, pain-free hallux with no impingement on the second digit is the goal.

Appropriate postoperative management is critical to avoid complications. Although ambulation may be al-

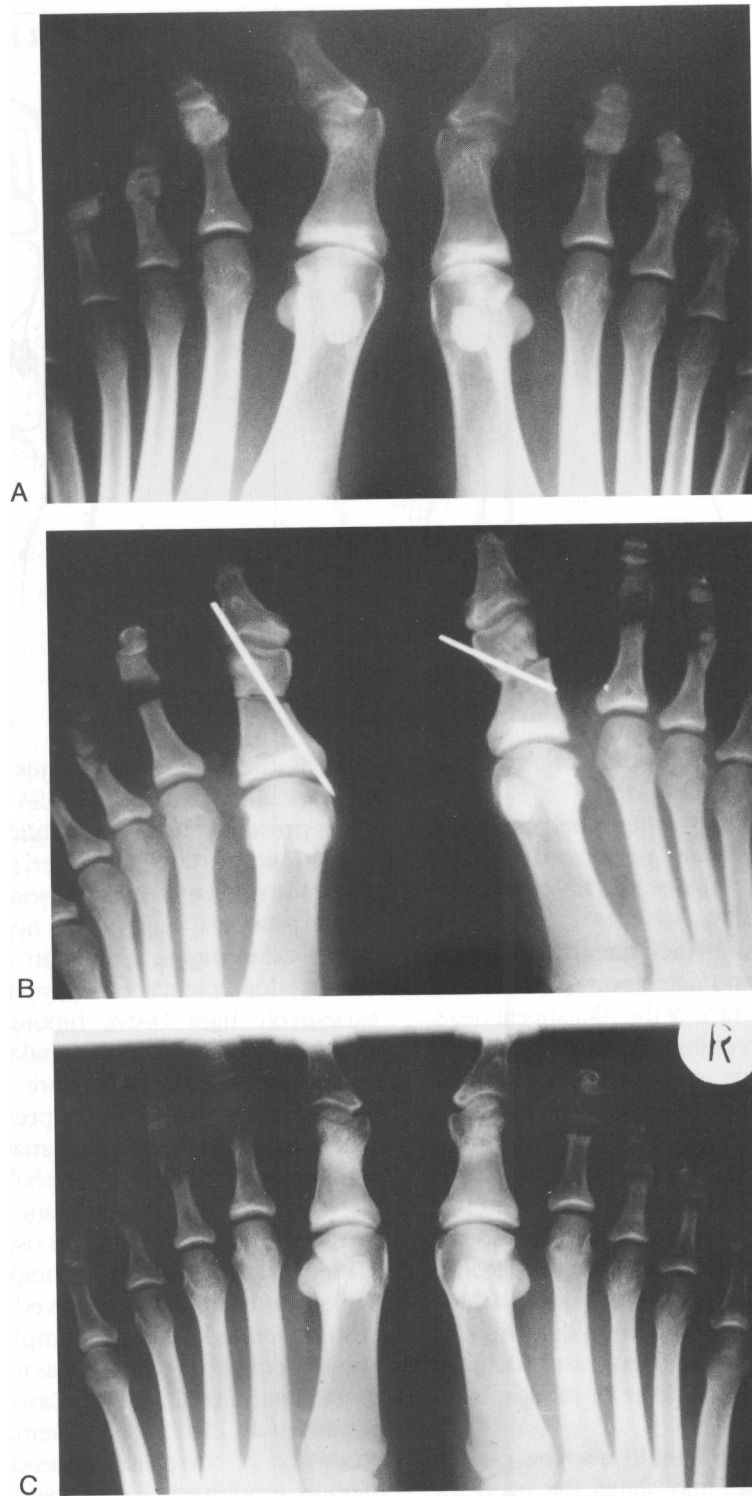


Fig. 8-5. (A) Preoperative congenital clinodactyly of the great toes. Abnormal hallux interphalangeal angle is apparent. Deformity of the interphalangeal joint is also demonstrated. (B) Postoperative distal Akin osteotomy with Kirschner-wire fixation. (C) Postoperative result. (*Figure continues.*)



Fig. 8-5 (*Continued*). (D) Preoperative hallux interphalangeus. (E) Postoperative distal Akin osteotomy with wire fixation. (*Figure continues.*)

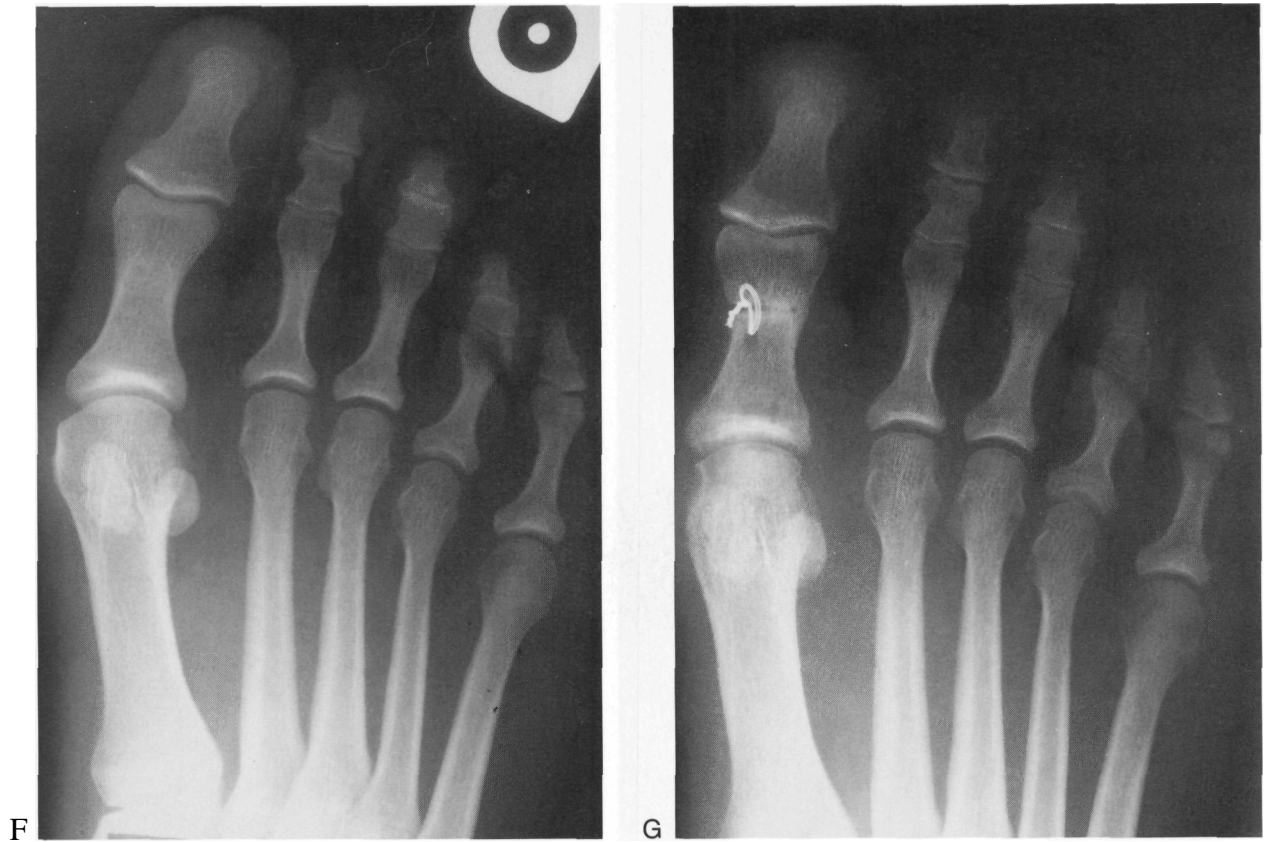


Fig. 8-5 (*Continued*). (F) Preoperative hallux valgus with interphalangeus. (G) Postoperative distal Akin osteotomy with wire fixation and intact lateral cortex. (*Figure continues.*)



Fig. 8-5 (Continued). (H) Postoperative radiograph demonstrating final result with complete bone healing. (I) Postoperative distal Akin osteotomy with fracture of the lateral cortex intraoperatively fixated by use of additional K-wire fixation. (J) Postoperative result.

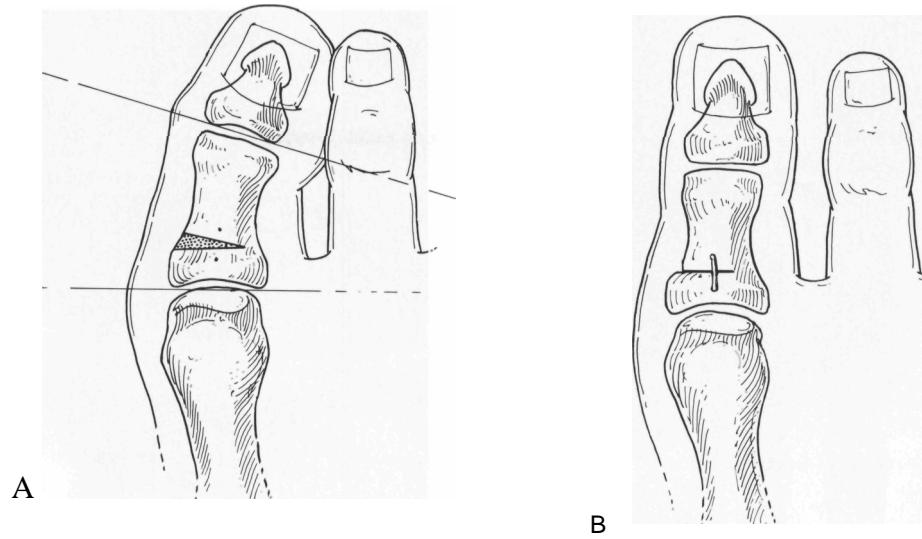


Fig. 8-6. (A & B) Proximal Akin procedure.

lowed immediately after surgery, use of a compressive dressing and a surgical shoe that eliminates the propulsive phase of gait are imperative. Athletic-type shoes may be worn at about the fourth week, with gradual return to normal shoe gear.¹⁴

In summary, use of the Akin osteotomy should be considered with realistic expectations. Indiscriminate

use of the so-called bump-Akin bunionectomy with little regard for preoperative criteria will likely result in recurrence and dissatisfaction for both the practitioner and patient. Expectations that implementation of a proximal Akin procedure will correct a moderate to severe hallux valgus deformity will likely be met with disappointing results. The proximal Akin proce-

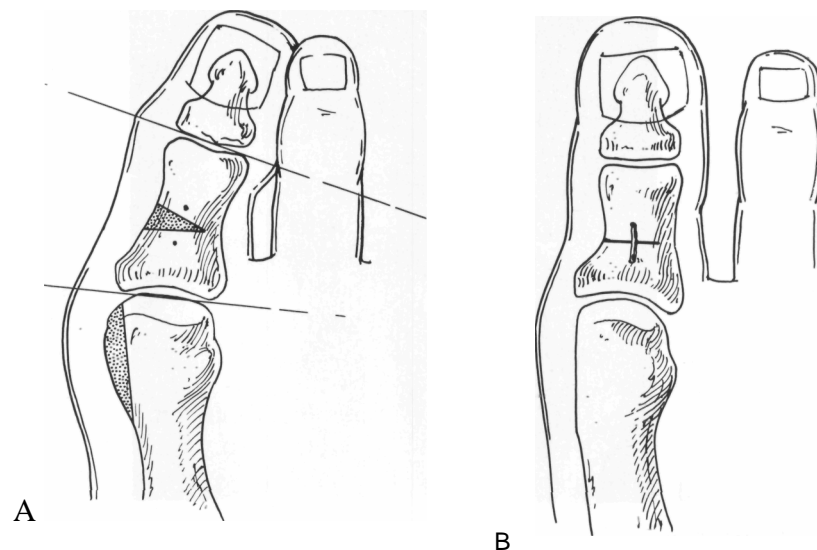


Fig. 8-7. (A & B) Distal Akin procedure.

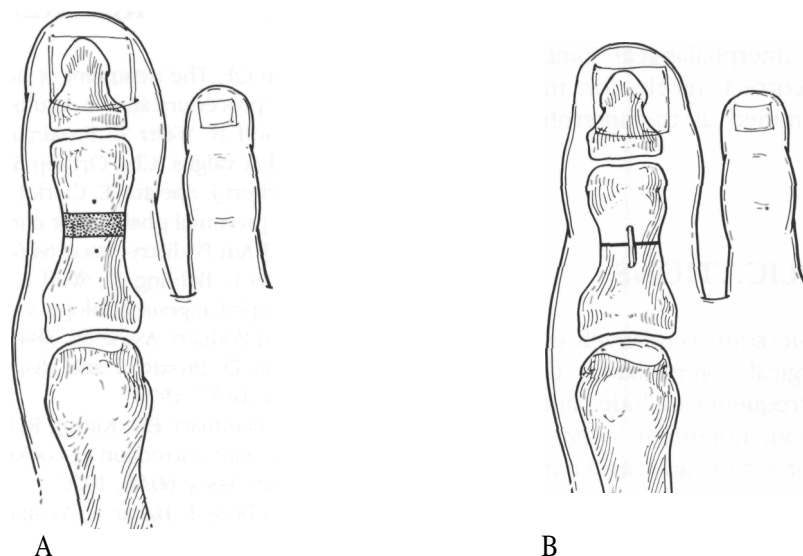


Fig. 8-8. (A & B) Cylindrical Akin procedure.

cedure should be utilized to correct a deformity distal to the first metatarsophalangeal joint and, in particular, an asymmetric proximal phalanx with the medial aspect longer than the lateral. In this light, the most valuable use of the procedure appears to be adjunctive.

DISTAL AKIN PROCEDURE

When the apex of the deformity is identified to lie in the distal aspect of the proximal phalanx, a distal Akin procedure is appropriate for correction. (Fig. 8-7) The criteria and performance of the actual procedure are very similar to those described regarding the proximal Akin procedure, with two important exceptions.

First, a primary indication for this osteotomy is an abnormal HAI value. This value is defined as the angle formed by the longitudinal bisection of the proximal and distal phalanges of the hallux. A value in the 5°-10° range, accompanied by signs and symptoms previously described, would suggest that a distal Akin procedure is indicated.^{3-5,13} Second, although the shape of the osteotomy is essentially identical to that of the proximal Akin, placement of this wedge is approximately 5 mm. proximal to the interphalangeal joint.

Once again, symmetry of the medial and lateral aspects of the proximal phalanx is a major goal.

OTHER VARIATIONS OF THE PHALANGEAL OSTEOTOMY

Preoperative evaluation often reveals that an excessively long proximal phalanx is the dominant pathology. To rectify this problem, an osteotomy has been described in which a cylindrical portion of diaphyseal bone of appropriate length is removed (Fig. 8-8). As this is a through-and-through osteotomy with violation of all cortices, adequate fixation is mandatory to avoid nonunion.^{3,6,13,14}

Reference has also been made to a derotational-type osteotomy of the proximal phalanx. The primary indication for use of this procedure is in the correction of exaggerated valgus rotation of the hallux, which is identified as a structural component of the phalanx itself, and not simply a positional rotation. Once again, adequate fixation is necessary because all cortices are generally osteotomized.¹⁶

Finally, interphalangeal joint arthrodesis is often considered a variation of the Akin-type procedures. This procedure should be considered for correction of sagittal plane deformities of the hallux, such as hal-

lux malleus. However, in cases of degenerative joint disease involving the interphalangeal joint, appropriate wedging can correct nicely for transverse plane deformities identified at the interphalangeal joint.

COMPLICATIONS

Although phalangeal osteotomy is relatively uncomplicated to perform, surgical complications do occur. Those occurring most frequently include pain, edema, infection, delayed union, nonunion, overcorrection (hallux varus), undercorrection, and sagittal plane hallucal deformities (e.g., hallux extensus, hallux malleus).¹⁴

Appropriate preoperative planning, intraoperative execution, (including fixation), and postoperative management will not eliminate postoperative complications but will certainly minimize their frequency. In this light, this procedure should not be utilized as a "cheater"-type procedure, used in an attempt to correct for an extensive, more proximal deformity because buckling at the metatarsophalangeal joint is likely to occur, compromising the result and dooming it to failure.

CONCLUSION

Phalangeal osteotomy can prove to be an extremely useful adjunct to more intricate and sophisticated procedures for the correction of hallux valgus deformity. However, its application is most useful in correction of deformities that lie distal to the metatarsophalangeal joint.

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