

# USES AND ABUSES OF THE AKIN OSTEOTOMY IN FIRST RAY SURGERY

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## INTRODUCTION

Since its inscription in 1925, the Akin proximal phalangeal osteotomy has been used to address a variety of deformities about the first metatarsophalangeal joint. Akin originally combined his procedure with what is now known as a Modified McBride bunionectomy to address a mild hallux valgus deformity. Since that time, podiatric and orthopedic surgeons have extended the indications and forwarded several technical modifications of the procedure. Some of these extended indications have been quite useful in addressing first ray pathology. Just as frequently, however, the procedure is being used inappropriately as a substitute for technically more difficult yet necessary procedures.

## INDICATIONS

While there is generalized agreement among practitioners as to the contraindications of the procedure, the accepted indications are not as clear cut. The procedure was originally designed to address the deformity of hallux abducto valgus in a very broad sense. History and experience however have allowed us to gain a much finer appreciation of the intricacies of the deformity.

It is now widely recognized that no single procedure can be generically applied to treat all types of hallux valgus deformities. As an isolated procedure, the Akin osteotomy has limited applications. (Table 1)

Of the primary indications listed, hallux interphalangeal deformity, and second digit pathology occur more frequently in clinical prac-

tice. A transverse plane deformity at the interphalangeal joint of the great toe is radiographically described by the Hallux Abductus Interphalangeal Angle (H.A.I.). (Fig. 1) The normal H.A.I. angle is 0-10 degrees. When this angle is increased, several pathologic scenarios may result. Pain can develop medially at the interphalangeal joint when irritated by certain types of shoe gear. A hallux interphalangeal deformity has certain cosmetic considerations as well. The lateral deviation of the great toe that exists with this deformity can leave a patient disappointed following bunion correction despite adequate reduction of the intermetatarsal angle.

The Akin osteotomy is also indicated when the great toe is causing secondary deformity at the adjacent second digit. The second digit can become affected in several ways. The constant pressure of the great toe may cause painful callus and pre-ulcerative lesions to develop medially in the area of the proximal interphalangeal joint. A secondary hammertoe contracture may also result following a longstanding hallux interphalangeal deformity. The Akin osteotomy would also be the

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**TABLE 1**

### INDICATIONS FOR THE AKIN OSTEOTOMY

1. Hallux Interphalangeal Deformity
    - a. symptomatic
    - b. cosmetic
  2. Second Digit Pathology
  3. Long Proximal Phalanx
  4. Abnormal D.A.S.A.
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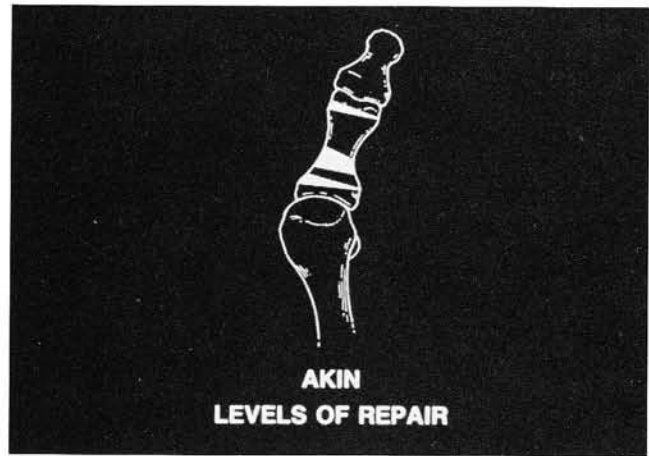
**Fig. 1.** Note the deviation within the proximal phalanx causing the increase in the hallux interphalangeal angle.

primary procedure of choice in cases involving a long proximal phalanx or an abnormal Distal Articular Set Angle.

The contraindications for the Akin osteotomy are well defined and accepted in both the orthopedic and podiatric communities. The procedure is designed to address structural deformities of the hallux and transverse plane adaptations at the interphalangeal joint. It should not be used as an alternative to metatarsal osteotomies and muscle-tendon balancing procedures when correcting a symptomatic bunion deformity.

### TECHNIQUE

Academically, there have been three types of Akin osteotomies described, each designed to address different types of phalangeal deformity. (Fig. 2) The distal Akin osteotomy is a medial closing wedge at the distal metaphyseal region of the proximal phalanx. Due to the more distal position, it has a greater ability to address deformities at the interphalangeal joint. The cylindrical Akin procedure involves the removal of a section of bone from the diaphyseal area of the phalanx. It is primarily used to address an abnormally long proximal phalanx. By orienting the arms of the osteotomy to allow a larger portion of bone to be removed medially, an abnormal Distal Articular



**Fig. 2.** Three locations for the Akin osteotomy designed to address different types of phalangeal deformities.

Set Angle (D.A.S.A.) or hallux interphalangeal can also be corrected. A proximal Akin procedure is a medial closing wedge at the base region of the proximal phalanx. Its more proximal location allows this osteotomy to effectively treat an abnormal D.A.S.A.

In addition to these three basic types of osteotomies, several technical variations have been introduced to accommodate different forms of fixation. In theory each type of osteotomy is used to treat a specific deformity. However, all types of hallux deformity are affected by each level of osteotomy. Another clinical question considers the use of the oblique osteotomy or the standard transverse cut. An oblique osteotomy design allows the use of rigid internal screw fixation. However in the case of hinge failure, a relatively unstable fracture scenario results. Displacement and shortening are predictable complications following oblique osteotomy fractures.

The two most common approaches used by the author and many members of the Podiatry Institute faculty are the transverse closing wedge at the base, and the oblique wedge performed at the base or head region of the phalanx. (Fig. 3) Fixation for the transverse type of osteotomy is best accomplished by the use of interosseous wire techniques. Other less stable alternatives are Kirschner wire and staple fixation. The oblique osteotomy is best fixated with a 2.0 mm or a 2.7 mm cortical screw delivered at a point halfway between perpendicular to the osteotomy and perpendicular to the shaft of the proximal phalanx.



**Fig. 3.** Oblique wedge Akin osteotomy with 2.7mm AO screw fixation.

## PROCEDURE

A 4-6 cm dorsal-medial approach from the interphalangeal joint to the metatarsophalangeal joint affords direct access to the entire proximal phalanx. The incision may also be an extension of the primary MPJ exposure. The concept of anatomic dissection is used to lift the superficial fascia from the underlying deep fascia both medially and laterally. The long extensor tendon can be freed and retracted laterally without tenotomy. A periosteal incision is then performed linearly along the phalanx. The periosteum is reflected medially and laterally. No periosteum should be lifted from the hinge. An axis guide is suggested before executing the osteotomy. A .045 K-wire can be placed at the hinge area of the proposed cut. A guide directed perpendicular to the weightbearing surface will allow for pure transverse plane correction.

If multi-plane correction is desired (ie: to correct a coexisting valgus rotation in the phalanx), the axis can be oriented accordingly. The use of the axis guide in performing this osteotomy is strongly recommended. Without this visual aid, it is easy to incorporate unwanted dorsiflex-

ion into the final correction. The design of the osteotomy is that of a wedge shape with the apex situated laterally and the base medially. The amount of bone resection is based on clinical intraoperative judgement. Preoperative templates may help in this calculation.

If a transverse wedge is performed, then a right angled intraosseous wire loop technique is used to secure the osteotomy. If the oblique osteotomy is used, the cortical screw is inserted from medial to lateral as described earlier. Closure is performed in anatomic layers. The postoperative weightbearing forces must be controlled until the osteotomy has healed. The use of a 1/2 inch felt pad placed from the heel to the metatarsal sulcus inside the surgical shoe will eliminate the propulsive phase of gait and protect the osteotomy.

## COMPLICATIONS

The most common complications following the Akin osteotomy are inadequate reduction of deformity and undesired hallux elevatus. Other less common complications include delayed or non-union of the osteotomy, pain at the interphalangeal or metatarsophalangeal joints, over-correction of the deformity, and a shortened hallux. Most of these complications are preventable by proper preoperative planning and meticulous execution of the procedure and respective fixation.

## SUMMARY

The Akin proximal phalangeal osteotomy plays a definite role in the surgical correction of pathology about the great toe. For structural deformities within the proximal phalanx and transverse plane adaptations at the interphalangeal joint, it is the procedure of choice. However when this osteotomy is used as an isolated procedure to address complicated hallux valgus deformities, the results are predictably disappointing and often disastrous. Cosmetic correction at the expense of structural correction is an unacceptable approach to hallux valgus surgery.