CHAPTER **8**

THE AKIN OSTEOTOMY WITH HORIZONTAL INTEROSSEOUS WIRE LOOP FIXATION

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In 1925, Akin[1] proposed a hallux valgus correction which included resection of the medial eminence of the first metatarsal head and adjoining base of the proximal phalanx, along with a medial closing wedge osteotomy of the hallux to straighten the great toe (Fig. 1). Today, the Akin osteotomy is still used as an adjunctive procedure to hallux valgus repair, but more importantly, it is used to correct a structural deviation in the hallux itself. Specifically, this lateral deviation in the hallux includes a high distal articular set angle or hallux abductus interphalangeous.

During the past 70 years, many methods of fixation have been described for both the proximal and distal Akin osteotomies (Fig. 2).[2,3] Akin originally described a technique of external splintage rather than internal fixation. As surgical techniques advanced, so did the methods of fixation. The Akin osteotomy was initially fixated with either one or two (crossed) K-wires (Fig. 3), or stainless steel wire loop fixation. Wire fixation

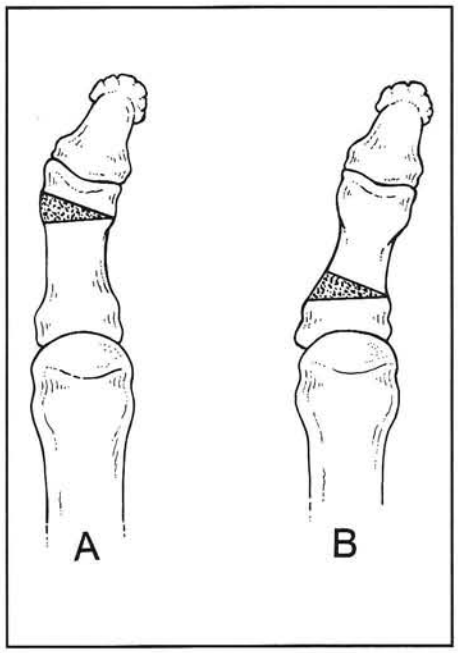

Figure 2. (A) Distal Akin osteotomy. (B) Proximal Akin osteotomy.

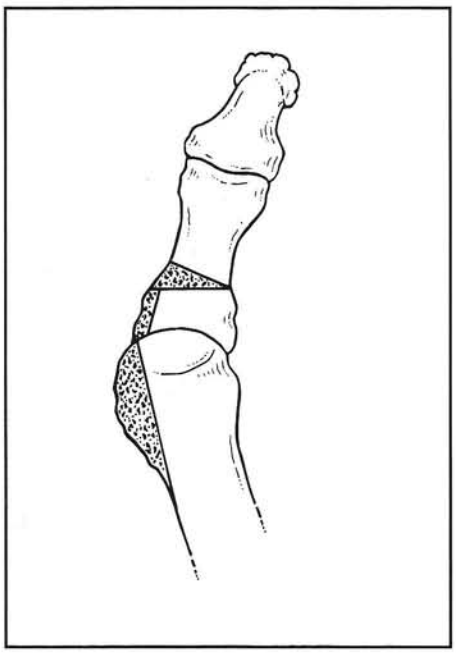

Figure 1. Traditional Akin osteotomy.

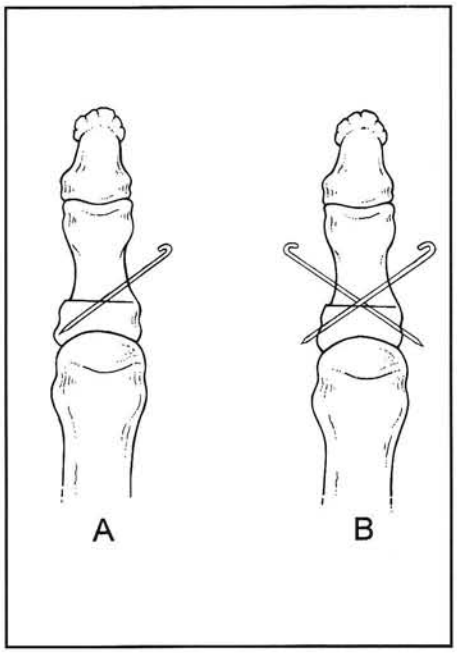

Figure 3. (A) Single K-wire fixation of the Akin osteotomy. (B) Double K-wire fixation of the Akin osteotomy.

typically uses a two cortices technique at the dorsomedial aspect of the osteotomy, where drill holes are made on either side of the osteotomy (Fig. 4). This method relies on an intact lateral hinge and minimal weight bearing to prevent dorsiflexion of the distal fragment, and gapping on the plantar aspect of the osteotomy. Boberg[3] describes a four cortex technique which involves a vertical loop perpendicular to the plane of the osteotomy (Fig. 5). This limits dorsiflexion of the distal segment but still relies on an intact lateral cortical hinge. Neither of these techniques provides rigid internal fixation that can withstand full weight bearing. Postoperative complications such as pain, swelling and delayed union or non-union are frequently encountered, especially if the lateral hinge fractures during closure.

In the early 1980s, the oblique Akin osteotomy facilitated the use of rigid internal screw fixation (Fig. 6)[4,5] This technique provides rigid immobilization with more predictable healing and fewer complications. One screw can provide lateral plane stability, provided the lateral cortex remains intact. This technique employs more advanced instrumentation than previously used, and requires a higher degree of surgical skill.

In the mid to late 1980s, staple fixation came into vogue (Fig 7). Both the Richards Mini Staple (Richards Manufacturing Company, Memphis, Tennessee) and the 3M Shapiro Stapilizer (3M Company, St. Paul, Minnesota) were improvements over the previously used hand-made staples fashioned from Kirschner wires.[6,7] The Richards scaphoid stainless steel staple is inserted into parallel predrilled holes. The 3M Stapilizer uses compressed air to propel a titanium staple into the bone. Compression is applied as the staple is

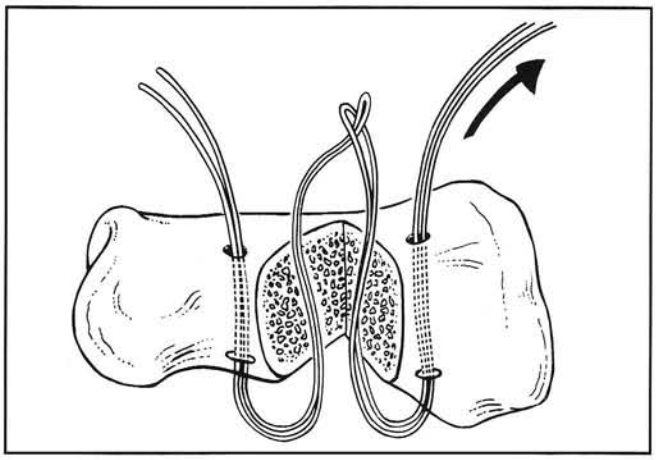

Figure 5. Four cortices monofilament wire fixation of the Akin osteotomy.

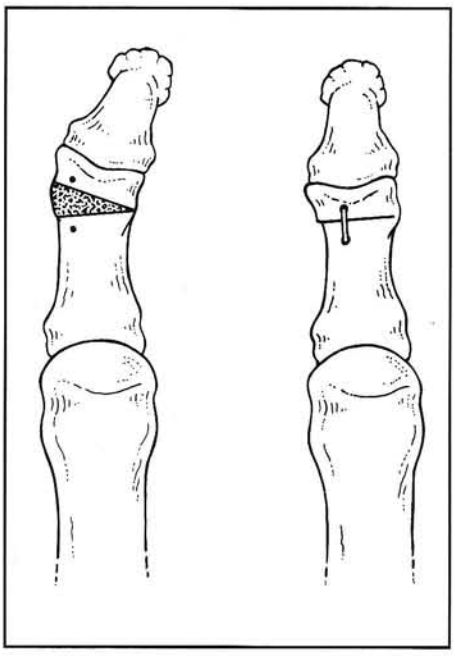

Figure 4. Two cortices monofilament wire fixation of the Akin osteotomy.

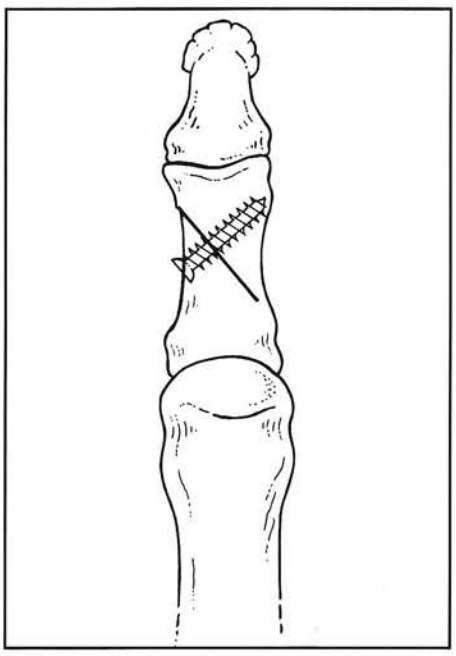

Figure 6. Screw fixation of the oblique Akin osteotomy.

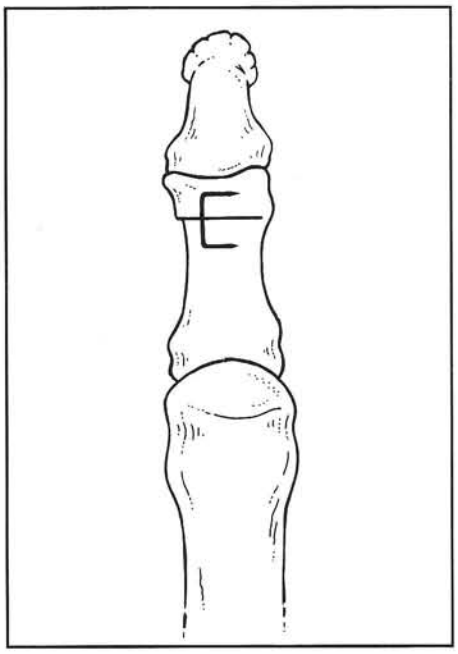

Figure 7. Staple fixation of the Akin osteotomy

inserted. Maintaining the lateral hinge is critical to the outcome of the procedure. If the hinge is sacrificed, two staples are needed.

It is the author's opinion that lateral cortical hinge fracture is the most common complication associated with Akin osteotomy. Fracture of the hinge occurs either during osteotomy closure, or as a result of stress applied to the bone during maneuvers involved in the fixation process. Fracture of the hinge can occur from bending forces of the K-wire, inappropriate screw placement, force of the stapilizer, or manipulation of the monofilament wire through the drill hole.

The modification to Akin osteotomy fixation described here utilizes a horizontal method of wire placement. The key to horizontal interosseous wire loop fixation is that the fixation is placed BEFORE the osteotomy is made. Therefore, the lateral cortical hinge is not disrupted by placement of the fixation. After the osteotomy is satisfactorily completed, the wire fixation is secured, and no further manipulation is needed. In addition, the fixation engages four cortices, medially and laterally, on both sides of the osteotomy. This prevents dorsiflexory forces from gapping the plantar surface of the osteotomy. The wire supports the lateral cortical hinge simply by the nature of its location.

THE PROCEDURE

A dorsal incision is made over the proximal phalanx which can be extended in a lazy "S" fashion to the medial aspect of the hallux interphalangeal joint for a distal Akin (Fig. 8). Dissection is carried through the subcutaneous tissue until the deep fascia overlying the proximal phalanx is identified. A longitudinal incision is made through the deep fascia and periosteum, medial to the extensor hallucis longus tendon exposing the site of the osteotomy.

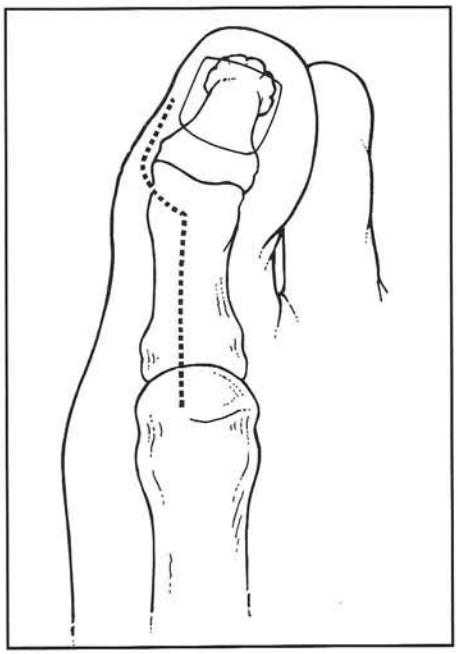

Figure 8. Incision placement longitudinally over the proximal phalanx of the hallux, curved medially along the interphalangeal joint.

Placement of the osteotomy is marked with a marking pen or osteotome (Fig. 9). Drill holes are then made on both sides of the osteotomy using a 1.5 mm or 2.0 mm drill bit or a .062" K-wire. The holes are placed approximately 1/8 inch from both sides of the osteotomy site, parallel to the planned osteotomy in the central aspect of the bone (Fig. 10). A slight angulation from plantar-medial to dorso-lateral will aid in insertion and retrieval of the wire on the lateral side. Double-stranded 28-gauge monofilament wire is then fed through the drill holes (Fig. 11). The free ends of the wire exit medially. The wire should lay flush against the lateral aspect of the bone.

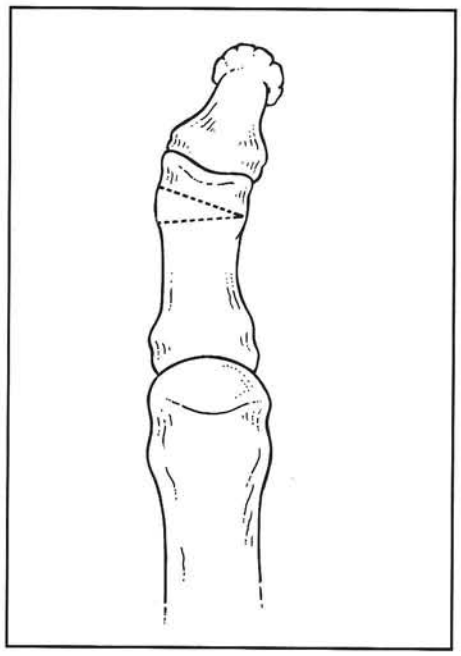

Figure 9. The proposed site of the osteotomy is identified with a marking pen or osteotome.

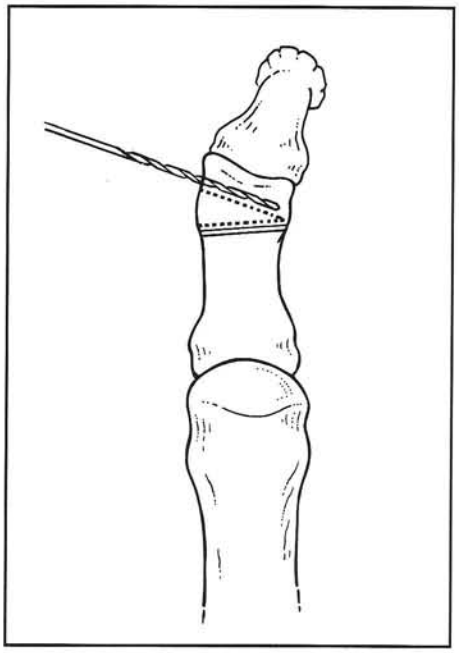

Figure 10. Two drill holes are placed on either side of the proposed osteotomy.

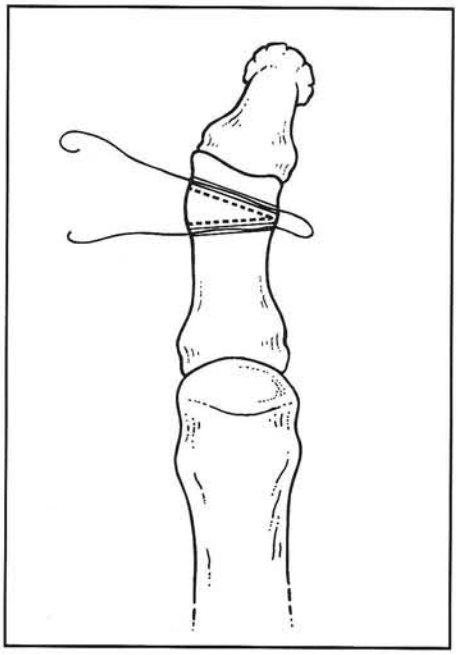

Figure 11. The monofilament wire is fed through the two drill holes, with the free ends exiting medially.

The osteotomy is then performed at the predetermined site (Fig. 12). After thinning of the lateral cortical hinge, the osteotomy is closed. The two free ends of wire are then grasped, wrapped around each other, and tightened down. The wire ends are cut short and fed into one of the drill holes (Fig. 13). The osteotomy is now secure and no further manipulation at the site is needed.

The site is irrigated, and the periosteum and deep fascial layers are closed with an absorbable 3-0 suture in a continuous fashion. The subcutaneous layer is closed using absorbable 4-0, and the skin is closed using absorbable 5-0 in a subcuticular fashion. Steri-strips are applied, followed by a sterile dressing.

Immediate, guarded weight bearing in a surgical shoe is permitted. Postoperative radiographs should demonstrate a closely-approximated osteotomy site surrounded by a horizontal stainless steel wire loop (Fig. 14).

In summary, the Akin osteotomy using horizontal interosseous wire loop fixation has been found to be superior to previously utilized fixation methods. The procedure is simple to perform and requires limited instrumentation. The fixation device is placed in the bone prior to performing the osteotomy, thereby reducing the chance of lateral cortical hinge fracture.

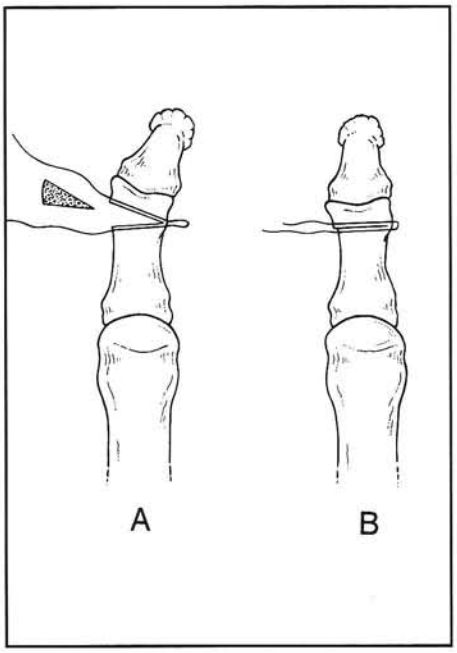

Figure 12. (A) The osteotomy is made with a power saw. (B) The osteotomy site is closed.

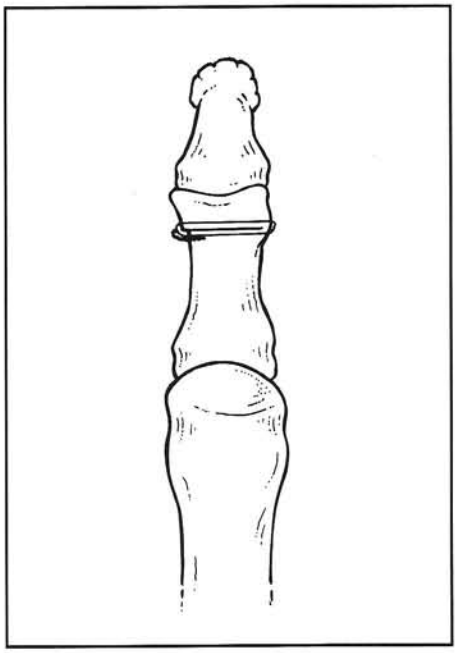

Figure 13. The monofilament wire is tied down, and the free end is cut and placed into one of the drill holes.

Figure 14. Dorsoplantar radiograph shows the osteotomy site to be closed, and the horizontal interosseous wire loop to be intact.

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