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CHAPTER

Akin Osteotomy

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SURGICAL MANAGEMENT

- The primary indication for an Akin osteotomy is hallux valgus interphalangeus or in cases in which residual hallux valgus causes pressure on the second toe on the load stimulation test.
- The Akin osteotomy is most commonly used to accompany a scarf or chevron osteotomy.
- An isolated Akin is contraindicated in the treatment of hallux valgus.
- We use a proximal medial closing wedge osteotomy that is fixed by a varisation screw (Depuy, Warsaw, IN).
- The osteotomy is fashioned within metaphyseal cancellous bone, ensuring excellent cancellous healing. The osteotomy, by being close to the apex of the deformity at the interphalangeal (IP) joint, allows for more powerful correction.

Preoperative Planning

- Surgery is performed on an outpatient basis.
- Anteroposterior (AP) and lateral weight-bearing radiographs of the foot are evaluated for metatarsal length, intermetatarsal angle, hallux valgus angle, distal metatarsal articular angle, and IP angle for cases that may require a proximal phalangeal osteotomy to obtain complete correction.
 - Congruency of the joint, presence of osteophytes, the size of the bony medial eminence, and position and condition of the sesamoids are noted.

Preparation and Positioning

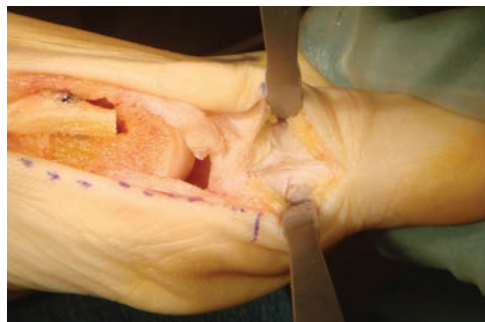
- Prophylactic antibiotics are administered.
- A thigh tourniquet is applied.
- The patient is positioned supine with a sandbag under the ipsilateral buttock so the big toe points to the ceiling.

TECHNIQUES

■ Akin Osteotomy

Exposure

- The exposure is performed usually as an extension to the midline longitudinal incision from the metatarsal osteotomy. If performed as an isolated procedure, the exposure must allow visualization of the metatarsophalangeal (MTP) joint proximally and the shaft of the proximal phalanx distally. The exposure of the shaft of the phalanx may require excision of overlying fatty tissue.
- After dissecting directly onto bone, the exposure is completed by periosteal elevation above and below the phalanx. Two small pointed retractors are placed above and below the phalanx to protect the extensor and flexor tendons (**TECH FIG 1**).



TECH FIG 1 • Incision is made directly to bone with subperiosteal dissection above and below the proximal phalanx.

Kirschner Wire Placement

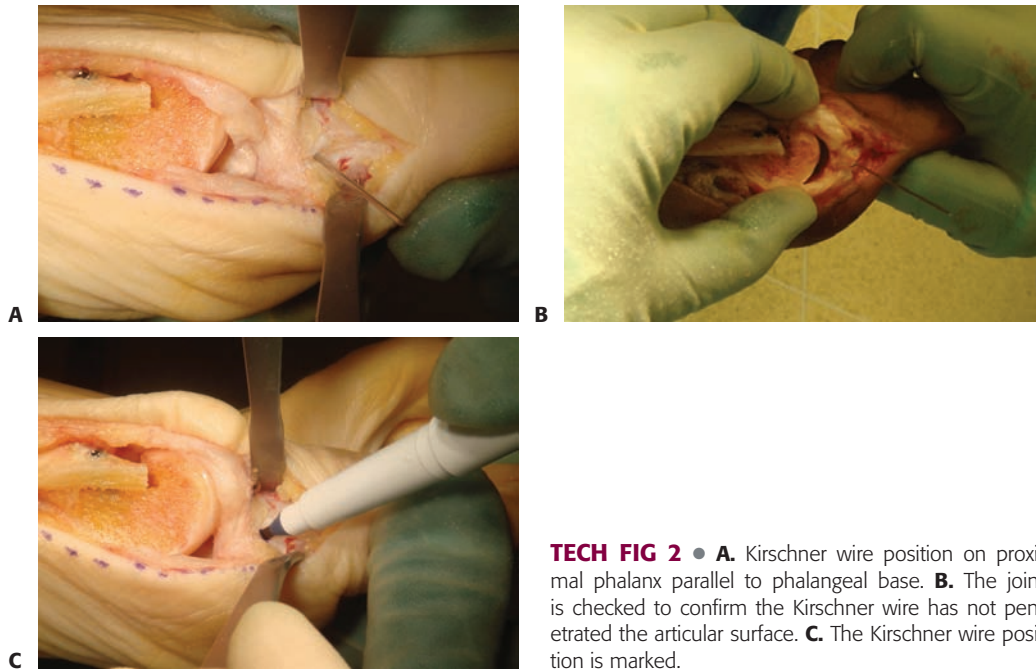
- A 1-mm Kirschner wire is placed in the midportion of the phalanx in the sagittal plane approximately 3 mm distal to the phalangeal flare (**TECH FIG 2A**).
- Traction on the big toe allows us to visualize the joint to ensure the wire is not intra-articular (**TECH FIG 2B**).
- The Kirschner wire is removed and the hole marked (**TECH FIG 2C**).

Osteotomies

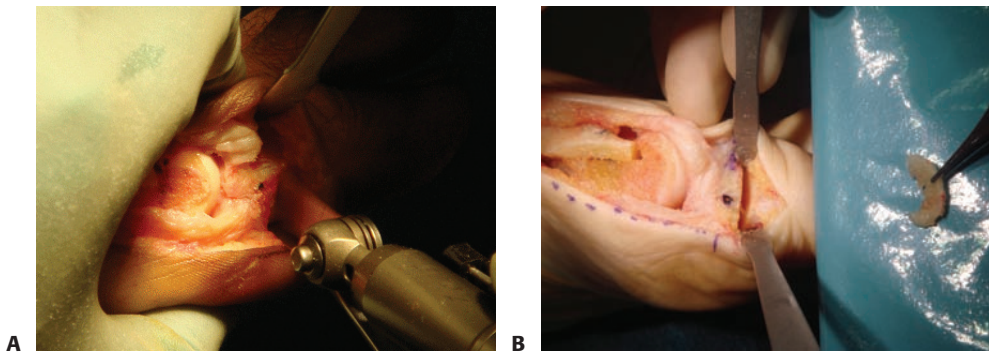
- Make the proximal cut parallel to the phalangeal base (**TECH FIG 3A**).
- To maintain control of the osteotomy, the lateral cortex is scored but not penetrated with the saw blade, thus allowing it to act as a hinge.
- The second osteotomy is created to produce a wafer of bone with the apex laterally (**TECH FIG 3B**). When removed, it should look like a fine slice of lemon.
- The wedge is closed with direct pressure. This “greensticks” the intact but weakened lateral cortex.

Staple Placement

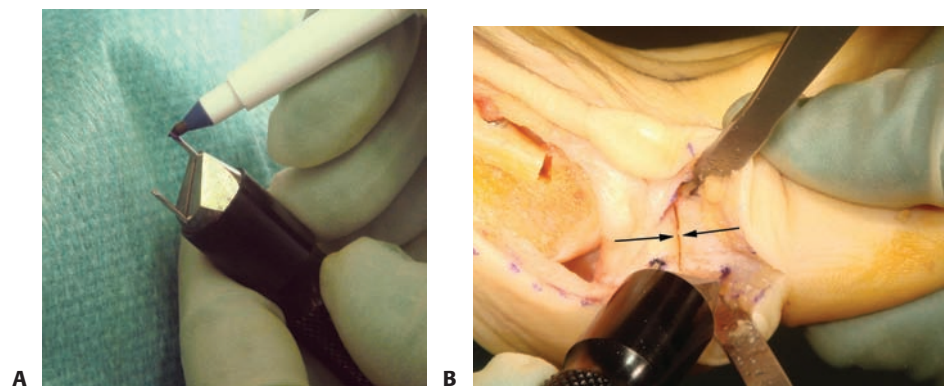
- The varisation staple (usually 8 mm; 10 mm in larger feet) is selected, and the tip of the distal end is marked with a pen (**TECH FIG 4A**).
- The staple is placed with the osteotomy compressed.
 - It should be on the midportion of the phalanx in the sagittal plane (**TECH FIG 4B**).
 - The distal staple leaves an ink mark. This mark is drilled with a 1-mm Kirschner wire (**TECH FIG 4C**) and then the hole is marked. The position for the staple can then be identified by the two bone marks.



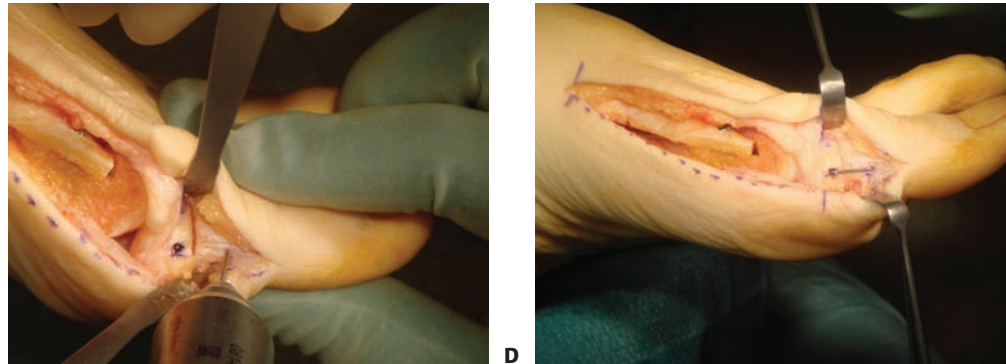
TECH FIG 2 • **A.** Kirschner wire position on proximal phalanx parallel to phalangeal base. **B.** The joint is checked to confirm the Kirschner wire has not penetrated the articular surface. **C.** The Kirschner wire position is marked.



TECH FIG 3 • **A.** The osteotomy is performed parallel to the phalangeal base. **B.** The second cut is performed to produce a small sliver of bone.



TECH FIG 4 • **A.** The staple is marked with a pen. **B.** The osteotomy is compressed (*arrows*) and the marked staple is placed in the correct position. (*continued*)



TECH FIG 4 • (continued) **C.** The distal mark is then drilled with a Kirschner wire. **D.** The staple is inserted with the osteotomy compressed.

- While maintaining compression, the staple is inserted in the pre-drilled holes.
- The stability of the fixation is checked (**TECH FIG 4D**), and axial traction confirms the staple is not in the joint.

Wound Closure

- The wound is closed in layers with continuous Monocryl to skin, and a forefoot bandage is applied to maintain the correction.

Case Example (Courtesy of Mark E. Esley, MD)

Background, Surgical Approach, and Preoperative Planning

- A 30-year-old woman with symptomatic left hallux valgus had increased intermetatarsal and hallux valgus angles.
- Radiograph suggests congruent (symmetric) hallux valgus deformity that may be indicative of an increased distal metatarsal articular angle (**TECH FIG 5A**).
- Plan for combination biplanar distal chevron and Akin osteotomies.
- I typically use a medial midaxial longitudinal approach through skin and capsule, extending it more distally than the approach typically used for distal chevron osteotomy alone.
- The dorsomedial sensory cutaneous nerve to the hallux and the extensor hallucis longus (EHL) tendon must be protected dorsally.

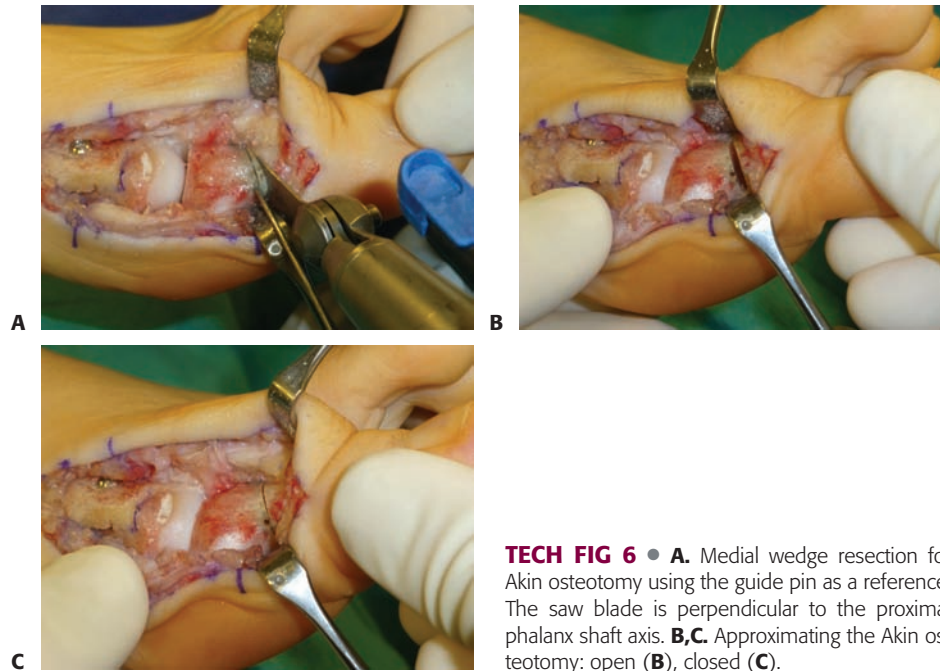
- The plantar medial sensory nerve and flexor hallucis longus (FHL) tendon need to be protected plantarly, with minimal periosteal stripping.
 - If possible, the plantar medial attachment of the medial capsule/medial collateral ligament on the proximal phalanx should be preserved.
- Intraoperative fluoroscopy is undertaken to plan for medially based closing wedge obliquely oriented osteotomy. A small-diameter Kirschner wire is used to guide the osteotomy (**TECH FIG 5B**).

Osteotomy Creation

- Medial cortex base wedge resection, using the Kirschner wire as a reference (**TECH FIG 6A**)
- The saw blade is perpendicular to the proximal phalanx shaft axis.



TECH FIG 5 • **A.** Preoperative radiograph of 30-year-old woman with symptomatic left hallux valgus. Note congruency/symmetry of the MTP joint, suggestive of an increased distal metatarsal articular angle. **B.** Intraoperative fluoroscopy of guide pin for planning oblique proximal phalanx osteotomy.

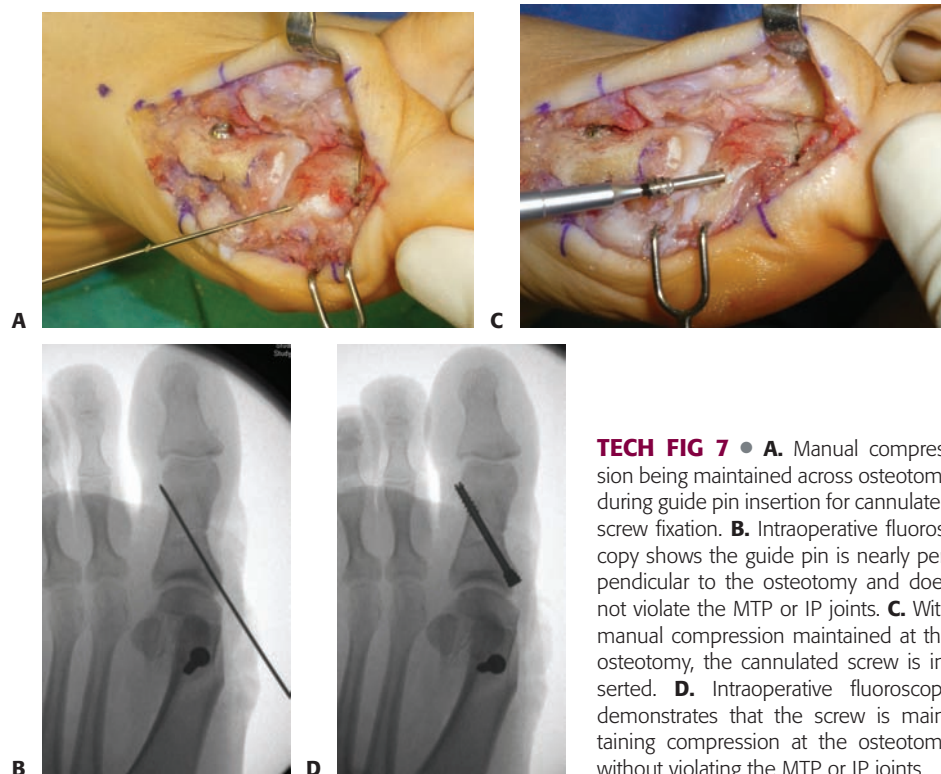


TECH FIG 6 • **A.** Medial wedge resection for Akin osteotomy using the guide pin as a reference. The saw blade is perpendicular to the proximal phalanx shaft axis. **B,C.** Approximating the Akin osteotomy: open (**B**), closed (**C**).

- The lateral cortex is not violated.
- With the wedge of bone removed and lateral cortex intact, the osteotomy is closed (**TECH FIG 6B,C**).
- Should the osteotomy not completely approximate, with the soft tissues protected, the saw blade may be reinserted into the osteotomy, with the osteotomy held closed as much as possible and run to make the surfaces fully congruent.

Osteotomy Fixation

- With the osteotomy held closed, a cannulated screw guide pin is inserted from the proximal medial aspect of the proximal phalanx without violating the MTP joint (**TECH FIG 7A**).
- The guide pin should be nearly perpendicular to the oblique osteotomy and not violate the IP joint (**TECH FIG 7B**).

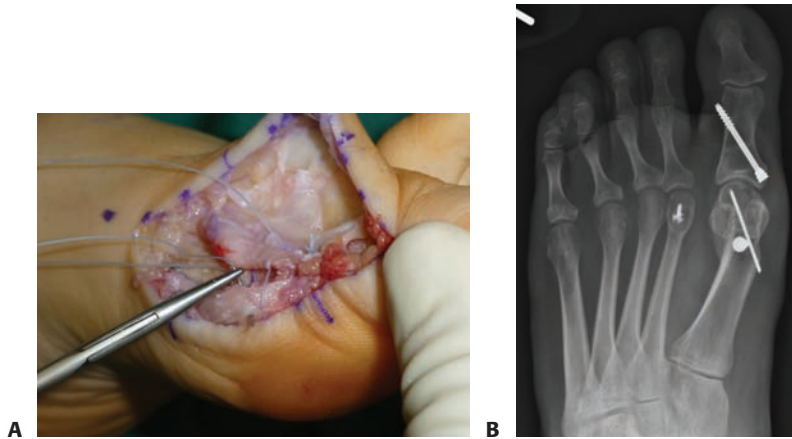


TECH FIG 7 • **A.** Manual compression being maintained across osteotomy during guide pin insertion for cannulated screw fixation. **B.** Intraoperative fluoroscopy shows the guide pin is nearly perpendicular to the osteotomy and does not violate the MTP or IP joints. **C.** With manual compression maintained at the osteotomy, the cannulated screw is inserted. **D.** Intraoperative fluoroscopy demonstrates that the screw is maintaining compression at the osteotomy without violating the MTP or IP joints.

- A lateral fluoroscopy image can be obtained to confirm that the guide pin is in optimal sagittal plane position.
- After overdrilling the guide pin and with the osteotomy manually compressed and rotation controlled, the cannulated screw is inserted (**TECH FIG 7C,D**).

Closure and Follow-up

- The periosteum and capsule are closed in concert with the standard medial capsular closure for hallux valgus correction (**TECH FIG 8A**).
- Follow-up radiographs to confirm satisfactory healing and alignment (**TECH FIG 8B**).



TECH FIG 8 • **A.** Periosteal and capsular closure in concert with routine medial capsular imbrication for hallux valgus correction. **B.** Follow-up AP radiograph.

PEARLS AND PITFALLS

Exposure	<ul style="list-style-type: none"> ■ The orientation of the osteotomy can be difficult if performed in the absence of a metatarsal osteotomy. Avoid the temptation to use a small incision, instead taking care to expose the MTP joint and the shaft of the phalanx.
Staple insertion	<ul style="list-style-type: none"> ■ Resistance may be encountered when inserting the staple due to the hard subchondral bone. Avoid using excess force when inserting the staple, as this may fracture the lateral “greenstick” cortex. Either repeat the Kirschner wire drilling or accept the staple 2–3 mm proud if a good hold is achieved.
Inadvertent lateral cortex fracture	<ul style="list-style-type: none"> ■ If the lateral cortex is fractured, then a compression screw is inserted from medial to lateral, spanning the osteotomy.
Overcorrection	<ul style="list-style-type: none"> ■ The osteotomy is very powerful, as it is at the apex of the deformity. Aim for a very fine segment of bone; it can be cut again if required.
Unable to greenstick the lateral cortex	<ul style="list-style-type: none"> ■ Often, a rectangle of bone as opposed to a wedge has been removed. Forcing it to close will crack the lateral cortex. Instead, use a gentle to-and-fro motion with the running saw while applying gentle compressive force. This thins the lateral cortex until the osteotomy closes without “bouncing back” once pressure is removed.

POSTOPERATIVE CARE

- If safe, patients are discharged home on the day of surgery with strict advice to elevate the foot whenever resting for the first 2 weeks.
- In most cases, they are allowed to bear weight on their heel and lateral forefoot in a hard-soled postoperative shoe.
- Cast immobilization is not required.
- The wound is inspected at 2 weeks, at which time the hallux is restrapped and patients are taught simple passive and active toe flexion–extension exercises.

- At 5 weeks postoperatively, the osteotomy is assessed with radiographs.
 - If there is some consolidation at the line of the osteotomy, the patient is instructed to wear a wide shoe or sneaker and to progress to full weight bearing as tolerated.
 - Strapping of the hallux is discontinued at this time.
 - Delayed union or nonunion is rare with this osteotomy.

OUTCOMES

- The most common indication for an Akin osteotomy is in combination with a metatarsal osteotomy for hallux valgus.

Outcomes are therefore reported together with satisfaction rates at between 85% and 95%.^{1,2,4} Very few studies have concentrated solely on the Akin.

COMPLICATIONS

- Complications of this osteotomy are rare³ but can include nonunion, nerve damage, infection, displacement of the osteotomy, and overcorrection or undercorrection. Failure to recognize propagation of the lateral cortex may increase the risk of subsequent displacement.

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