Progressive Akin Osteotomy

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ABSTRACT: The most common complication associated to Akin osteotomy is the intraoperative fracture of the lateral cortex of the proximal phalanx. We present a progressive Akin osteotomy that preserves the lateral cortex of the proximal phalanx and allows to remove the exact wedge size to achieve the preoperative planned correction.

KEYWORDS: akin, osteotomy, hallux valgus

Introduction

The Akin osteotomy is a medially based closing wedge osteotomy of the proximal phalanx described by OF Akin in 1925. It is usually performed for the correction of a hallux valgus deformity in conjunction with a first metatarsal osteotomy, hallux interphalangeal deformity, and long proximal phalanx.

The most common complication associated to this procedure is the intraoperative fracture of the lateral cortex of the proximal phalanx. This can occur due to excessive weakening of this cortex by the saw oscillation, or to resection of a large bone wedge. Lateral hinge fracture causes, despite osteosynthesis, osteotomy instability with the consequent risk of secondary displacement.

When the surgeon plans to perform 2 separates cuts, there is an inherent risk to remove an excessive bone wedge, which would produce an unavoidable varus deformity of the phalanx. Besides, a phalanx shortening happens when a wedge of the bone is removed during osteotomy. Any of these facts can lead to an unpleasant cosmetic result with a bayonet deformity.

The main goal of this article was to show a progressive Akin osteotomy that preserves the lateral cortex of the proximal phalanx to avoid osteotomy instability and removes the exact wedge size to achieve the preoperatively planned correction. To our knowledge, it has not been previously described.

The Surgical Technique

A longitudinal medial incision over the first proximal phalanx or a distal extension of the medial incision over the first metatarsophalangeal joint is made. A peristeal incision is performed along the phalanx to expose the basilar portion of the proximal phalanx. Two mini Hohmann retractors protect the flexor and extensor tendons. At 5 to 7 mm from the metatarsal joint, a perpendicular osteotomy to the long axis of the proximal phalanx with a 1-mm-thick saw is performed (Figure 1). The osteotomy stops at 2 to 3 mm from the lateral phalanx cortex (Figure 2). The index finger of the left hand is placed between the great and second toes, and the thumb is placed at the level of the metatarsophalangeal joint of the great toe. The osteotomy opens, and the lateral cortex of the proximal phalanx remains intact (Figure 3). With the index finger and the thumb, a varus force to close the osteotomy is made (Figure 4). Sequential steps of the saw through the osteotomy are performed. After each step, the surgeon can check if he releases the varus force and the wedge size is achieved (Figure 5). The control of the great finger and the saw cut avoids the fracture of the lateral cortex of the phalanx. Therefore, a progressive phalanx osteotomy with the exact size wedge to achieve the planned correction is obtained. An 8 × 26 mm² staple is used to fix the osteotomy (Figures 6 and 7).

Figure 1. Saw at 5 to 7 mm from the metatarsal joint to perform a perpendicular osteotomy to the long axis of the proximal phalanx.
Discussion

The main objective in an Akin osteotomy is to maintain the lateral cortex of the phalanx as an additional point of fixation. But in patients with poor bone stock, the cortex is thin and brittle, and it is easy to break the cortex during reduction.

Maybe, an oblique oriented osteotomy reduces the chance of hinge failure, as it was suggested by Boberg et al.⁴

But a perpendicular oriented osteotomy to the long axis of the proximal phalanx achieves a greater degree of correction and more stable fixation. Douthett et al⁵ reported 47
intraoperative lateral cortex phalanx disruptions in 132 patients, and 88.6% of the osteotomies were perpendicular to the longitudinal axis of the phalanx. Additional fixation is often required when a lateral cortex disruption happens.

Multiple methods of fixation have been published in the literature. Staples are easy to use. They have a great adaptation to proximal phalanx anatomy, and it is not frequent to require removal. However, there is no current evidence about the proper position of the device with relation to the osteotomy to maintain maximum stability. We recommend the use of a single staple in the medial side of the proximal phalanx with this progressive Akin osteotomy.

Shortening of the proximal phalanx is produced when a wedge of the bone is removed. Frey et al indicated that for a correction of 8°, 16°, and 24°, a 3-, 5-, and an 8-mm-thick wedge had to be removed, respectively. And they provided these data as a guideline to remove the minimum of the bone necessary of the proximal phalanx.

Maybe, Akin osteotomy is considered a simple procedure performed at the end of a hallux valgus correction procedure. But surgical complications can occur, so that the stability and fixation of the osteotomy should be accurate. We propose a progressive Akin osteotomy to preserve the lateral cortex of the proximal phalanx, promote rigid fixation, and avoid excessive bone resection and hypercorrection. During the entire surgical procedure, the surgeon can control and determine, on demand, the quantity of the bone that is needed to be removed. The expectations allow us to be optimistic for the future. However, additional studies will be needed to determine whether this technique can be of benefit in hallux valgus correction.

**Author Contributions**
All the authors conceived and planned the article. EMG and CVR performed the surgery. JSR wrote the article. MMS, DBSdP, and JMM supervised the article. All authors provided critical feedback and contributed to the final article.

**Informed Consent**
Written informed consent for patient information and images to be published was provided by the patient.

**Level of Evidence**
Level V, expert opinion.

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