Osteotomy Considerations in Hallux Valgus Treatment
Improving the Correction Power

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KEYWORDS
• Hallux valgus • Osteotomy • Correction power • Biomechanical evaluation
• Medial plates • Rotational scarf • Chevron • Proximal opening wedge
• Proximal closing wedge

KEY POINTS
• Osteotomies for hallux valgus treatment should be chosen depending on the preoperative deformity and the correction capacity of that particular osteotomy.
• To improve the correction power of a displacement osteotomy we can add rotation. Inversely to improve the power of a rotational osteotomy displacement should be added.
• Multiple points of fixation should be preferred for diaphyseal osteotomies; medial fixation should be preferred for proximal osteotomies.

INTRODUCTION
Many different treatment alternatives exist for hallux valgus surgery. Because none has been shown to be more effective than any other, more than 200 different surgeries have been designed. Osteotomies have been recommended for hallux valgus surgery for the last 2 decades, with good success rates and reliability over time.1 The recurrence rate of the deformity depends on the preoperative deformity and also on the postoperative sesamoid reduction quality, being higher if the hallux valgus angle is greater than 37° to 40°, and if there is an incomplete reduction of the sesamoids after surgery.2–4 For this reason, the correcting power for each procedure (i.e., the intermetatarsal angle that an osteotomy can correct) should be known so that the best surgical procedure can be selected for every patient. In general, distal osteotomies are less powerful and are preferred for mild deformities. Proximal osteotomies are powerful and able to correct large intermetatarsal angles; they are the general choice for severe deformities.5

Author disclosures: The authors have no financial affiliations to disclose.
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When correcting a hallux valgus deformity, the technique chosen should depend on the deformity to be corrected and the individual correction power a particular technique possesses. Although the classic intermetatarsal angle value is less than 9°, when correcting an hallux valgus deformity, there are individual variations in the angular measurements and not every hallux valgus is the same. Clinicians should try to achieve the best alignment and correction for each patient. In hallux valgus, the deformity comes from a medial deviation of the metatarsal bone, in which the sesamoids mark the original position where the metatarsal head was located. The ideal position for the metatarsal head should be to lie on top of the sesamoid complex. An incomplete postoperative reduction of the sesamoids constitutes a risk factor for recurrence of the deformity. Because of this, we currently use a new angular measurement to choose our osteotomy to correct the intermetatarsal angle, known as the angle to be corrected. This angle is obtained by drawing a line through the first metatarsal axis and then drawing a second line from the same starting point on the base of the first metatarsal but going distally through the middle of the sesamoid complex. This angle represents the number of degrees the metatarsal must be moved to center the head over the sesamoids. After defining the correction power of each technique, the proper surgical procedure can be chosen, and this allows us to propose an algorithm of treatment. In this way, we have defined a surgical protocol in which, for angles to be corrected between 0° and 5°, we use the chevron osteotomy; for angular corrections between 5° and 9°, we suggest the rotational scarf osteotomy; and for angular corrections of more than 10°, we prefer a proximal osteotomy called POSCOW (proximal oblique closing wedge osteotomy).

In an observational study performed in the United States regarding the preferred surgical techniques of academic foot and ankle surgeons, the chevron was the most common technique chosen for mild deformities in 87%, and the preferred techniques for severe deformities were first metatarsophalangeal arthrodesis (26%), cuneometatarsal arthrodesis (24%), Ludloff (24%), and proximal metatarsal osteotomies (24%). This article discusses strategies and osteotomy considerations to improve the correction power of chevron, Ludloff, scarf, and proximal osteotomies for hallux valgus correction.

OSTEOTOMY OPTIONS
Chevron Osteotomy
Chevron osteotomies are inherently displacement osteotomies and, as such, they are limited by the width of the metatarsal bone. Five millimeters of lateral displacement for this osteotomy has traditionally been performed, and it is well known that it corrects 1° of intermetatarsal angle (IMA) per millimeter of lateral displacement. Biomechanical studies have shown that a 60° chevron osteotomy fails by rotation of the distal fragment in relation to the proximal fragment. Increasing the angle between the arms of the osteotomy has been suggested as a way to increase compressive forces between the fragments, and therefore increase mechanical bonding. The 90° chevron is currently our choice when performing a chevron osteotomy for mild deformities when the angle to be corrected is 5° or less. Another advantage of this modification is that it gives more room for fixation, our current preference being a 2.0 minifragment screw. Although no study has shown superiority between K wires or screws when fixing chevron osteotomies, we prefer to use fixation devices that do not need to be removed.

Modifications to increase the correction power refer to displacement maximization. Displacements up to 60% have been reported, with a 2-year follow-up with excellent results. In these cases, only K wires can be used for fixation, preferably 2 to control rotation, and this has to be considered regarding the need for removal.
Diaphyseal Osteotomies

Diaphyseal osteotomies are either displacement or rotational osteotomies. Displacement osteotomies are limited, as are distal osteotomies, by the width of the bone. They can be displaced safely up to 5 mm, which limits their correction power, and they do not alter the distal metatarsal articular angle because they do not impose any rotation on the metatarsal bone. However, rotational or angular osteotomies do not have a width limitation, and theoretically have more correction power. They do alter the distal metatarsal articular angle because they impose some rotation to the metatarsal bone, and this is their most important limitation in their correction power.14 The most well-known diaphyseal rotational or angular osteotomy is the Ludloff osteotomy.

Ludloff Osteotomy

This osteotomy was originally an oblique mid-diaphyseal osteotomy that started dorsally 1.5 cm distal to the metatarsocuneiform joint and progressed distally and planterly, exiting proximal to the sesamoid complex.15 It was later modified to achieve the longest osteotomy possible, starting as proximal to the tarsometatarsal joint as possible, with the lowest inclination possible, and ending just proximal to the sesamoid complex.16 Another important consideration when rotating the osteotomy was that the closer the pivot point to the tarsometatarsal joint, the greater the correction achieved, and this can be understood using realignment concepts, which state that the closer to the center of rotation of angulation a deformity is corrected, the better the correction (with less translation) is achieved. Good intermediate-term results have been published regarding the modified Ludloff osteotomy, for 111 feet with an improvement of 35 points in the American Orthopaedic Foot and Ankle Score (AOFAS), with good angular improvements, and only 2.2 mm of shortening without dorsiflexion malunion.17

Efforts to further improve the correction power of this osteotomy have tried to increase the rotation, which therefore decreases the contact area and the intrinsic stability. Different modifications have been made to improve its fixation, namely K wires and plates.18 Although no biomechanical study has evaluated the use of plates for diaphyseal osteotomies, dorsally and medially applied plates have been used for proximal osteotomies and have been shown to have an improved fixation,19–21 and consequently it can be assumed that medially applied plates also improve diaphyseal osteotomy stiffness.

Scarf Osteotomy

The most well-known diaphyseal displacement osteotomy is the scarf osteotomy, which has been well described in the literature.22,23 Its major theoretic advantage compared with a distal chevron osteotomy is a bigger area of bone contact (270 mm² compared with 116 mm² for the chevron24), which allows a greater displacement, therefore achieving a better correction of the deformity. It can correct up to 6° of intermetatarsal angle, limited by the width of the metatarsal bone.25 Modifications such as short straight osteotomy arms instead of a 60° inclination apparently reduces the risk of troughing that has been reported in up to 35% of cases.23 Regarding fixation, a 2-point fixation has traditionally been recommended, using Barouk screws, cannulated screws, or minifragment screws.26 Based on our failures, a 3-point fixation achieves a larger area of contact between the fragments and therefore should decrease postoperative loss of correction. Failures have been seen with rotation of both fragments in relation to one of the screws, and therefore having an additional point of fixation should decrease the risk of correction failure. Structural failures are most commonly seen at the most proximal fixation site, that is, the proximal screw.
where the osteotomy runs longitudinally from plantar proximal to distal dorsal. Biomechanical studies have shown that the scarf osteotomy causes significant changes in stiffness and cortical bone strains at the proximal apex where a critical weakening is produced.11 To avoid this type of failure, care must be taken to leave the dorsal shelf of bone as thick as possible at the proximal apex of the osteotomy.

Modifications to improve its correction power include increasing the lateral displacement, or adding rotation. Up to 7° of correction have been reported on the IMA angle to achieve more displacement, but without achieving a statistically significant difference compared with the chevron osteotomy.27 When increasing displacement, the contact area decreases proportionally, and so care has to be taken when fixing it because failure risk and troughing may increase. Maximal displacements have been described in the literature, but with no clinical results to date, in which the medial cortex of the distal fragment of the metatarsal bone lines up with the lateral cortex of the proximal fragment, and an inside-out plating is performed to fix it.28 The other modification described consists of adding rotation to this displacement osteotomy, which has been called the rotational scarf.

Fig. 1. Geometric model to estimate the maximum correction capacity of the rotational scarf osteotomy keeping bone contact in 50%. Section A-A shows a medial view of the osteotomy.
Rotational Scarf

To improve the correction power of the scarf osteotomy, rotation was added to it, using 2 of the more commonly used concepts in osteotomy execution: displacement and rotation. Described in 1992, the rotational scarf uses rotation in relation to the most proximal lateral aspect of the metatarsal bone, keeping the general shape of the scarf osteotomy, thus maintaining a broad bone contact between the fragments. In this way, better angular corrections with more than 50% of lateralization of the distal fragment can be achieved, keeping at least 50% of bone contact.29 Recent clinical articles suggest that the rotational scarf decreases the risk of troughing30 and the need for an Akin osteotomy,31 although there is no evidence in the literature to prove it (the rotation imposed on the scarf osteotomy differs between studies).

The rotational scarf osteotomy can achieve geometrical correction through a proximal center of rotation, and has the power to correct up to 9° of intermetatarsal angle, maintaining bone contact in 50%.7 The rotational scarf osteotomy with proximal center of rotation has been our choice for hallux valgus deformities during the last 5 years for patients with angles to be corrected between 5° and 9°. A geometric model was developed to study its correction power keeping bone contact in 50%, and its maximum correction power was calculated to be 9° (Fig. 1). We currently prefer 3 points of fixation (ie, 3 screws) because this theoretically should decrease the failure rate that we have seen when fixing the osteotomy with just 2 screws. The proximal aspect of the longitudinal osteotomy ends in a plantar situation, trying to leave a thick dorsal shelf of bone to reduce the risk of postoperative fracture, because this is the weakest point of the osteotomy (as mentioned earlier).

Fig. 2. A moderate hallux valgus deformity. Note the medial deviation of the first metatarsal and the subluxated sesamoid bones.
Surgical Technique

A medial longitudinal incision over the first metatarsophalangeal joint is performed (Fig. 2). An inverted-L capsulotomy is performed, exposing the metatarsal bone. The first metatarsal is exposed and dissected subperiosteally, leaving the lateral and plantar distal area intact to preserve circulation. A diaphyseal osteotomy is then performed, starting from plantar proximal to distal dorsal, with 2 arms oriented 90° to the main osteotomy line exiting through the plantar and dorsal cortex respectively (Fig. 3). The osteotomy is made as long as possible, normally measuring 4 cm in length. A translation and rotation around a proximally situated center of rotation is then performed, leaving approximately two-thirds of the width of the bone in contact proximally and one-third in contact between the 2 fragments distally, which corresponds approximately with 4 mm of displacement proximally and 11 mm of displacement distally (Fig. 4). This amount of displacement, because it is unequal in both bone ends, produces a lateral displacement and a rotation of the distal fragment, achieving a correction of approximately $8^\circ$ to $9^\circ$ of intermetatarsal angle. Because of small intraoperative changes caused by the internal fixation and because of postoperative bone remodeling, we have observed that a higher displacement is needed to achieve an adequate correction, and we currently displace distally almost 90% of the width of the metatarsal head, and proximally 30% of the width of the metatarsal base. Both fragments are held temporarily with a K wire and a bone clamp and fixed with 3 2.0-mm screws. We use three 2.0-mm screws from the compact foot set (Synthes, Switzerland), from the dorsal to the plantar aspect of the bone, unevenly spaced from proximal to distal. This disposition is used because of the larger area of bone contact obtained when using 3 screws and the increased theoretic resistance to torque when having screws at uneven distances. The overhanging bone is resected, and a traditional closure of the periosteum and capsule is performed (Fig. 5). Depending on the metatarsophalangeal balance after the metatarsal correction, a decision is made regarding the need to perform an Akin osteotomy. The subcutaneous and skin layers are closed with reabsorbable sutures. A postoperative dressing is applied, and a postoperative shoe is used. See Figs. 6 and 7 for preoperative and postoperative radiographs from a clinical example.

Fig. 3. Medial view of rotational scarf osteotomy. Note the diaphyseal osteotomy performed as long as possible, starting from distal dorsal to plantar proximal, with 2 arms oriented 90° to the main osteotomy line exiting through the plantar and dorsal cortex.
Fig. 4. The distal and proximal displacement of the rotational scarf osteotomy, leaving a medial overhanging bone that is resected later (arrow). The distal displacement is as great as possible, reaching 90% of the width of the bone. The proximal displacement is approximately 30% of the width of the bone, thereby achieving a rotational effect.

Fig. 5. Fixation of the osteotomy has already been performed with three 2.0-mm screws. The medial overhanging bone is resected. The total displacement is represented by the black area of the metatarsal bone.
RESULTS

Rotational scarf osteotomy results have been published recently, but there are technical differences within the same technique. In 2011, Murawski30 showed a rotational scarf but with a center of rotation of angulation near the middle of the metatarsal bone, as they rotate both the distal and the proximal ends. This center of rotation allows correction of the intermetatarsal angle with alteration of the distal metatarsal articular angle, and the investigators did not take advantage of any lateral displacement of the plantar fragment. Although theoretically it has a similar center of rotation as the Mau osteotomy, and therefore its potential to correct intermetatarsal angle could be low, the results showed a large correction power, with 10° of intermetatarsal angle improvement (before surgery 18°, range 9°–23°; after surgery 8°, range 6°–12°). A later article also dealt with rotational scarf osteotomies, but using a proximal center of rotation with more displacement distally than proximally.31 In that article, 34 feet were evaluated, operated on with the rotational scarf osteotomy, and minimum follow-up was 12 months (average 26.4 months). There was a 94% satisfaction rate, the hallux valgus angle improved from 34.6° to 14.9°, and the intermetatarsal angle improved from 15.8° to 7.2°.

In the last 5 years we have performed more than 500 rotational scarf osteotomies with a proximal center of rotation, almost always with good to excellent results. We have followed a small series of 18 patients since 2007; 28 feet, all treated with a rotational scarf osteotomy. Average age was 49.8 years, mean follow-up was 54 months. The satisfaction rate was 94.5%, with a mean AOFAS score of 97.6 points. The
intermetatarsal angle improvement was 7.4° (before surgery 14.8°, range 8.7°–16.7°; after surgery 7.4°, range 3.4°–11.5°). The metatarsophalangeal angle improved 11.8° (before surgery 23.7°, range 14°–27.5°; after surgery 11.9°, range 1.7°–16.6°). An Akin was needed in 4 feet (14%). In these series, we have only 1 case with persistent metatarsalgia, which was in the unsatisfied patient.

Proximal Osteotomies

Proximal osteotomies are either displacement osteotomies, like the proximal chevron osteotomy in which correction is achieved through lateral displacement, or angular osteotomies such as the proximal crescentic osteotomy, in which rotation is performed to achieve correction of the intermetatarsal angle. For distal and diaphyseal osteotomies, the correction power of proximal displacement osteotomies are limited by the width of the bone, which, in the base of the first metatarsal, corresponds with approximately 20 mm, and therefore 10 mm of displacement is considered the maximum possible translation to keep bone contact in 50%. These osteotomies correct 1° of intermetatarsal angle per millimeter of lateral translation, and therefore they are not powerful techniques.

For severe deformities, angular osteotomies have been recommended because they achieve more correction. Angular osteotomies achieve correction through rotation in relation to a proximal center of rotation, which immediately gives them an increased correction power, at the same time increasing the distal metatarsal articular angle. Some examples of angular osteotomies are the proximal crescentic osteotomy, proximal opening wedge osteotomy, and proximal closing wedge osteotomy. A combined osteotomy (POSCOW) has also been presented that uses displacement
and rotation, thereby using both concepts of osteotomy correction and requiring less alteration of the distal metatarsal articular angle.

**Proximal Chevron Osteotomy**

This osteotomy was first described by Sammarco. It consists mainly of a lateral displacement osteotomy, and is limited by the width of the bone, which gives it a mild correction power of approximately 1° of intermetatarsal angle corrected per millimeter of lateral displacement. It is more stable than a proximal crescentic osteotomy because of its geometry, thereby avoiding dorsiflexion malunion of the first metatarsal or shortening of the bone.

Improvements in its correction power regarding technique and fixation have been achieved. Regarding technique, besides lateral displacement, some angular correction has been added, with impaction of the lateral side of the osteotomy achieving good correction power, with 20° of hallux valgus correction and 9.5° of intermetatarsal angle correction. Improving fixation to reliably preserve the correction has also been attempted. Medial locking plates have been described as having excellent results, achieving 16° of hallux valgus improvement and 7.6° of intermetatarsal angle improvement, with an average AOFAS score of 94 points, with no transfer lesion after surgery.

**Proximal Crescentic Osteotomy**

This osteotomy was popularized by Mann. Because it uses a crescentic saw blade, it achieves an excellent correction of the intermetatarsal angle through angular rotation at the base of the metatarsal bone. Because it is a mainly vertical osteotomy, it is less stable than the proximal chevron, and therefore it needs strong fixation to be stable. Good results have been shown using fixation with just a screw and a K wire, with a hallux valgus angle correction of 22° and an intermetatarsal angle correction of 9°, with just 17% of dorsiflexion malunion, which is less than was originally described. Efforts to improve its fixation to avoid malunion have been reported, such as using dorsal plates, which have been shown in cadaveric studies to produce a 100% improvement in the resistance to failure of the construct. Clinical studies reporting dorsal plates have shown excellent satisfaction rates, with corrections of 17.9° of hallux valgus angle and 6.6° of intermetatarsal angle improvement. Another option to avoid dorsiflexion malunion is to incorporate into the osteotomy a plantar flexion position of the metatarsal bone, rotating it plantarly after performing the osteotomy. However, although theoretically attractive, no real advantage in terms of arch height improvement or increased first metatarsal declination angle has been shown with this modification.

**Proximal Opening Wedge Osteotomy**

This was first described in 1923 but instability and concerns about nonunion made it unpopular. This osteotomy mainly corrects the intermetatarsal angle through lateral rotation of the metatarsal bone with the addition of medial wedges of different sizes. It can lengthen the bone and increase the distal metatarsal articular angle because the correction is achieved through angular correction without any displacement. It has increased in popularity in the last few years, with the advent of new plating techniques that use locking plates with fixed opening wedge sizes. Proximal opening wedge osteotomies are stable osteotomies in which the lateral cortex should not be violated, but a medially placed locking plate construct can perform equally well regarding stiffness, even compared with Ludloff constructs, at least in initial cyclic loading in a cadaveric study. Clinical studies show excellent results, with hallux valgus angle improvements of 14.7° and intermetatarsal angle improvement of 6.4°. The mean increase in metatarsal length was 2.3 mm, which cannot be associated with any
symptom related to tightening of soft tissues like decreased metatarsophalangeal range of motion\textsuperscript{39} or predisposition to jamming of the metatarsophalangeal joint.\textsuperscript{40}

Efforts to improve its correction power have focused on increasing the medial wedge without violating the integrity of the lateral cortex. A linear relation seems to exist between the size of the medial wedge and the correction achieved, although it plateaus using the 6-mm opening wedge plate.\textsuperscript{39} Concern still remains regarding the possible effect on metatarsophalangeal pressure and its limit in correction power because, although reported to correct $3^\circ$ per millimeter of opening wedge, the average improvement in intermetatarsal angle ranges from $6^\circ$ to $10^\circ$.\textsuperscript{39–41}

**Proximal Closing Wedge Osteotomy**

Compared with an opening wedge osteotomy, the main difference of this osteotomy is that it shortens the metatarsal bone, and therefore there is no concern regarding changes in intraarticular pressure or decreased range of motion, but it also alters the distal metatarsal articular angle because all the angular correction is achieved through the resected wedge. Good to excellent results in up to 85\% of patients have been reported with basilar closing wedge osteotomies, but concern exists regarding complications such as dorsiflexion malunion and first metatarsal shortening and subsequent transfer metatarsalgia.\textsuperscript{5} To overcome these risks, efforts have been made to increase fixation strength using plates. Results from more than 70 hallux valgus feet operated on with a first metatarsal closing wedge osteotomy fixed with dorsal minifragment plates were recently reported.\textsuperscript{42} The average hallux valgus angle improvement was $20^\circ$ and

![Geometric model used for calculating the correction power of the POSCOW osteotomy.](image)
the intermetatarsal angle improvement was 8.8°. The absolute first metatarsal shortening was only 2.2 mm, and sagittal first metatarsal alignment showed just 1.3° of dorsiflexion. These results probably indicate a refined surgical technique and the advantages of using strong fixation to ensure good postoperative alignment.

**Combined Osteotomy: POSCOW Osteotomy**

To combine the advantages of proximal displacement osteotomies (which maintain metatarsal length and do not alter the distal metatarsal articular angle) and the correction power of angular osteotomies (which can correct as many degrees as wanted, depending on the rotation imposed on the metatarsal), a modification of a closing wedge technique was designed and named POSCOW. This technique has been our choice for many years, and we recommend it for hallux valgus deformities in which the angle to be corrected is more than 10°. Our first cases were fixed with dorsal mini-fragment plates, and over the years, we changed to minifragment locked medial plates. Using medial fixation improves the stiffness of the construct over dorsal plates by 158% if using titanium locked plates and 228% when using steel nonlocked plates.

Fig. 9. A severe hallux valgus deformity. Note the medial deviation of the first metatarsal and the complete dislocation of the sesamoid bones.
A geometric model was designed to study its correction power and how to determine the size of the resected wedge and the lateral displacement (Fig. 8). It was determined that a lateral proximal displacement of 5 mm would correct 4° of intermetatarsal angle and that, to correct 1° of additional intermetatarsal angle, a bone wedge with a lateral base of 0.4 mm had to be resected. Because the osteotomy is performed perpendicular in both planes (transverse and sagittal) to the metatarsal bone, its plane is oblique in relation to the second metatarsal bone, going proximal medial to lateral distal. Thus, with the lateral displacement, a slight lengthening of the bone is achieved. This lengthening was calculated to be 1.3 mm for an IMA angle of 15°, and 1.8 mm for an angle of 20°. This lengthening partially compensates for the expected shortening any closing wedge osteotomy produces.

**Surgical Technique**

A medial longitudinal incision over the first metatarsophalangeal joint is performed (Fig. 9). An inverted-L capsulotomy is performed, exposing the metatarsal bone. The first metatarsal is exposed and dissected subperiosteally, leaving the lateral and plantar distal area intact to preserve circulation. A careful resection of the bunion is performed following the medial cortex of the metatarsal bone. Then a proximal metatarsal osteotomy is performed, with a straight cut from the dorsal to the plantar aspect of the metatarsal bone 15 mm distal to the base of the bone and perpendicular to the long axis of the metatarsal bone (Fig. 10). Depending on the angular correction needed, a laterally based wedge of bone is removed from the proximal aspect of the distal fragment, as determined in the preoperative planning. A lateral displacement of 5 mm is performed, moving the base of the metatarsal bone laterally (Fig. 11).
Fluoroscopic control is taken to ensure parallelism between the first and second metatarsals and adequate reduction of the metatarsal head over the sesamoids. The fixation is performed with a medially placed angular stable plate with 2 locking screws distally and 2 locked screws proximally (Fig. 12). Depending on the metatarsophalangeal balance after the metatarsal correction, a decision is made regarding the need to perform an Akin osteotomy. The capsule, subcutaneous, and skin layers are closed with reabsorbable sutures. A postoperative dressing is applied, and a postoperative shoe is used. A clinical example is shown in Fig. 13.

RESULTS

Our results from 56 feet (mean age 55 years, follow-up of 35 months) show a satisfaction rate of 87%. The average improvement was 24° for the hallux valgus angle and 11° for the intermetatarsal angle. The mean first metatarsal shortening was 1.5 mm. Deformity recurrence requiring revision was observed in 7% of the cases, most commonly...
Fig. 12. The fixation is performed with a medially placed angular stable plate with 2 locking screws distally and 2 locked screws proximally.

Fig. 13. Clinical example of a severe hallux valgus deformity, with preoperative and postoperative views and the postoperative radiograph.
solved with the addition of a distal chevron osteotomy. We had 1 nonunion that required revision and 1 failed fixation that resolved with immobilization in a cam walker. Transfer metatarsalgia was observed in 3.5% of the cases. Most of the complications occurred in the first year of use of this osteotomy, because the learning curve included the use of both displacement and rotation, and the optimization of the fixation method. We observed less shortening than expected, and we think that performing the osteotomy in an oblique fashion compensates for the shortening caused by the closing wedge.

SUMMARY

Efforts are currently being made to improve results in hallux valgus treatment. Different studies to design procedures that are more stable and efficient to correct deformities are underway, and new techniques will be presented in the following years. Better fixation devices will offer reliability in corrections, and hopefully will allow faster rehabilitation with fewer restrictions.

Understanding the concept of correction power is important when deciding which technique to use. The origin of hallux valgus is not known, but evidence exists to assume that a correct skeletal and soft tissue balance is important to prevent recurrence and obtain good function. We think that a correct metatarsophalangeal reduction, in which the final position of the hallux is defined mainly by the skeletal alignment and not soft tissues, will dictate the final result. Pushing the metatarsal bone over the sesamoids and not moving the sesamoids under the metatarsal head is a new concept and it may allow better results for our patients. It is hoped that understanding of biomechanics will continue to evolve, and radiological measurements and corrections will produce better functional results for patients.

REFERENCES
