CHAPTER **32**

THE CLOSING BASE WEDGE OSTEOTOMY FOR HALLUX VALGUS DEFORMITY

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INTRODUCTION.

The scientific literature has examined surgical means to correct hallux valgus for over 100 years. Depending on surgeon preference along with clinical indications, distal and/or proximal osseous procedures have yielded acceptable results. Some soft tissue augmentation is almost always employed as well. Together, reproducibility has also increased using improved technique and surgical instrumentation. Generally, postoperative care is minimal, and healing is typically uneventful.

Proximal first metatarsal osteotomies are indicated for the surgical correction of moderate to severe hallux abducto valgus (HAV or simply hallux valgus) deformities, including metarsus primus varus, because of their powerful angular corrective feature. The oblique closing base wedge osteotomy (CBWO) is such a procedure, and one that has been a reliable mainstay over the years namely because it has become amenable to several stable fixation techniques for predictable results. Though minimal frontal plane reorientation is possible while maintaining a medial cortical hinge, its most effective endpoints occur along the transverse and sagittal planes.

Employing a basilar approach such as the oblique CBWO can effectively correct the deformity while preserving joint motion (Figure 1). With this technique,

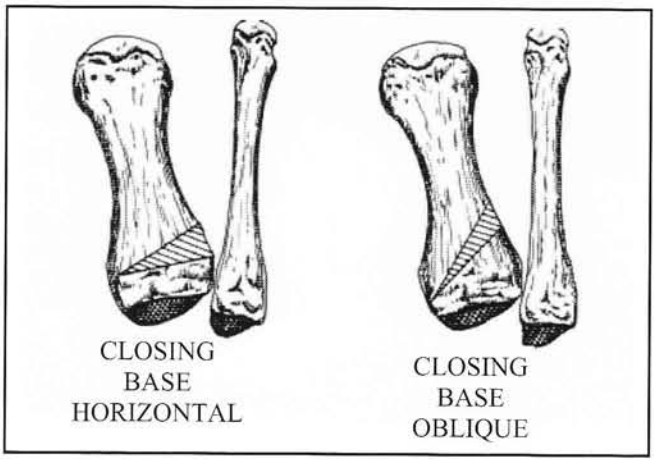

Figure 1. The horizontal (transverse) CBWO versus oblique CBWO.

"no bridges are burned" in essence since secondary proximal joint fusion is still possible should future needs arise. In the meantime, intra-articular weight-bearing forces across all joints are maintained and redistributed in natural fashion to maintain an adaptable (supple) plantargrade foot.

The classic transverse closing wedge osteotomy through the base of the first metatarsal was initially described by Loison in 1901. It was performed in 1903 by Balacescu, who additionally resected a wedge of bone from the medial cuneiform.[1,2] In 1919, Juvara is credited for utilizing the oblique cut CBWO.[3] When the base wedge osteotomy became more widely used around 1970, complications such as first metatarsal elevatus, shortening, failed fixation and delayed bone healing occurred all too frequently. This led many advocating the procedure to abandon it, believing that less than satisfactory results were inherent to the procedure. However, as a result of improved surgical technique, appropriate stable fixation, and sufficient postoperative nonweightbearing protection, subsequent outcomes showed the CBWO to be a powerful tool in the arsenal against severe hallux valgus.[4]

Members of the Podiatry Institute (Tucker, GA) introduced the contemporary version in 1977 as a long-arm oblique wedge designed for fixation by 1 or 2 cortical or cancellous screws as opposed to K-wire or wire loop techniques. The proximal osteotomy oriented 45 degrees from the longitudinal metatarsal axis using accepted AO technique.[5] The obliquity of the osteotomy yields a longer cut, effectively reducing the amount of bone one removes from the wedge. This facilitates less metatarsal shortening as opposed to the classic transverse osteotomy. Furthermore, this procedure also lends itself to the hinge axis concept for accurate triplanar positioning of the metatarsal upon reduction of the angular deformity.[4,6,7]

Perhaps the most important but less obvious advantage of the CBWO is preservation of motion across the first ray, both distally and proximally. It avoids creating increased stiffness that occurs with arthrodesing procedures, and helps to maintain a supple and mobile foot architecture. The CBWO further mitigates gait disintegration and abnormal mechanotransduction to

surrounding joints, which can lead to new joint pathologies and inefficiency in gait. To help restabilize a foot with medial column instability, the first metatarsal can be plantarflexed by virtue of the osteotomy as required if excess sagittal plane motion is noted.

This retrospective study was designed to gather radiographic data following the oblique CBWO using proper AO (Arbeitsgemeinschaft für Osteosynthesefragen) technique. The healing process of bone and examination of the final weight-bearing first metatarsal position were of special concern. Clinical objective and subjective data were also analyzed from patients who were available for followup.

MATERIALS AND METHODS.

Subjects

Patient selection was based on 90 consecutive CBWO procedures performed between 1988 and 2004 whose office medical charts were available from the two senior authors (RMG, DRG). There were 30 patients (43 feet) who responded to the standardized survey. Twenty of these patients (30 feet) were available for followup. Remarkably, all 30 feet were from females. The average age was 45.4 years, ranging from 16-63 years at the time of surgery. The average age at followup was 51.2 years, and the average postoperative time to followup was 5.1 years.

Inclusion criteria involved patients who underwent an oblique CBWO with distal modified McBride bunionectomy (soft tissue release and exostectomies/cheilectomies). No patients were excluded from the study unless proper radiographs or chart records were unobtainable. Several patients had multiple procedures involving the lesser rays. Nearly all subjects underwent surgery for the first time, although a few involved revisional surgery. Those having undergone the CBWO were excluded, however, if ancillary distal osseous procedures were concomitantly performed on the first ray. Patients with current smoking habits were asked to abstain, but were not necessarily excluded from the procedure if smoking continued. Very few patients were smokers.

Radiographic studies.

Plain-film weightbearing data were collected using AP (anterior-posterior) and lateral views in standard angle and base of gait. An MO (medial oblique) nonweightbearing view was also obtained. Most, but not all, patients also had postoperative stress-dorsiflexory lateral views of the first metatarsal phalangeal joint, while only a few had preoperative views as well (Figure 2). Preoperative films were obtained typically within a one month span prior to the procedure. In several cases, preoperative evaluations were based on images older than one month, especially where bilateral CBWO procedures were performed at different times.

Bone Healing

The CBWO healing progression was monitored by reviewing both radiographic and chart documents. When available for followup, patient subjective accounts were also taken into consideration. The goal was to make clinical and radiographic correlations to rule out probable delayed union or non-union in symptomatic patients showing no other reasonable explanation for prolonged postoperative pain in the vicinity of the primary osteotomy. Radiographically, these complications were expected to be best observed on the MO and lateral views.

First Ray Elevatus: The Kinetic Inclination Metatarsal (KIM) Index.

The method of Seiberg[5] for assessing and tracking metatarsus primus elevatus preoperatively and postoperatively was integrated into this study for comparison to a newly proposed index, the Kinetic Inclination Metatarsal (KIM) index. The Seiberg Index measures the weightbearing relationship between the dorsal cortex of the first and second metatarsals (Figure 3). This new KIM Index is a structural index referencing the all-important weightbearing plantar surface of the first metatarsal head to a proximal and stable anatomic landmark within the first ray. It is hypothesized to be more consistent regardless of small variances in radiographic technique, or larger variances introduced by supinatory guarding of the medial column by patients.

Figure 2. Weightbearing dorso-lateral stress view.

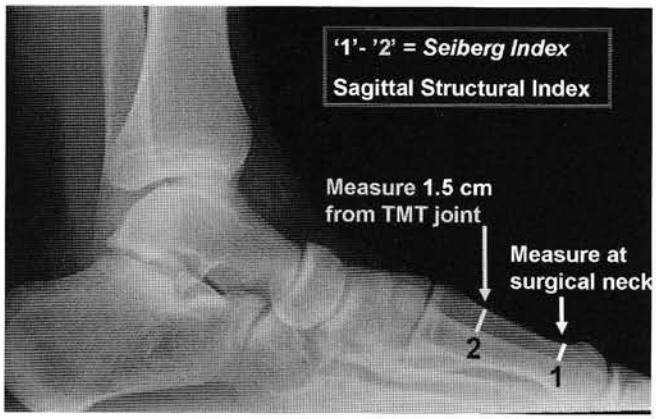

Figure 3. The Seiberg Index.

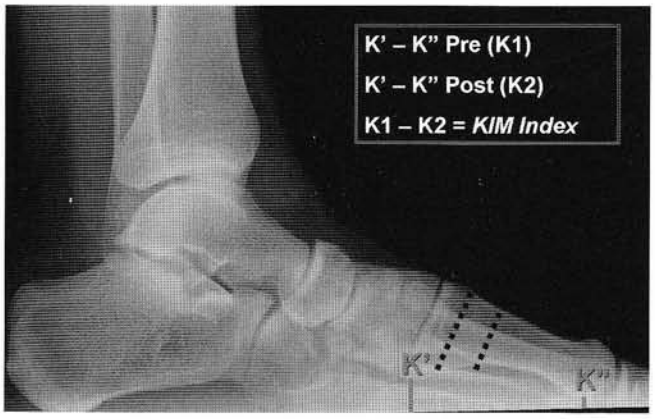

Figure 4. The Kinetic Inclination Metatarsal (KIM) Index.

The KIM index is obtained by measuring the lateral view perpendicular height difference (in millimeters) relative to the weight-bearing horizontal between the proximal plantar first metatarsal base articular cortical apex, and the most plantar tangential subchondral apex of the metatarsal head (Figure 4). The same measures are obtained postoperatively. The postoperative difference is then deducted from the preoperative value yielding a positive or negative number (in millimeters) representing the KIM index [KIMpre – KIMpost = KIM Index]

A positive KIM index value denotes conditions consistent with a true structural elevatus, whereas a negative value denotes a structural metatarsus primus equinus (plantar declinated metatarsal). This is a true structural index because the difference postoperatively relies on sagittal plane changes of the distal segment relative to the proximal segment with the CBWO. The 2 anatomic landmarks are proximal and distal to the osteotomy site without relying on other anatomic features. Postoperative changes to the KIM index should be largely independent of the foot's position or tilting aberrations by the x-ray beams since both segments will be altered in unison while the weightbearing reference plane remains constant.

Metatarsal Protrusion

The measure of metatarsal protrusion distance (MPD) by circumscribed distal arcs tangential to the first and second metatarsal heads was used to quantify the relative metatarsal lengths before and after surgery. The apex created by the traditional longitudinal bisection of the first and second metatarsals was used to determine the distal reference point for the tangential arcs. The proximal point for the compass was determined by the intersection of the two longitudinal bisections. The distance between these two arcs is the MPD (Figure 5).

Surgical Technique.

Following IV sedation, the selected foot was anesthetized using 1% lidocaine with 1:200,000 epinephrine. No tourniquets were utilized in these patients. The extremity was prepped according to standard protocol towards the tibial tuberosity. Once the proper McBride bunionectomy is complete, the standard dorsomedial bunion incision is extended proximally for a total dorsolinear length between 8 to 9 cm. It must extend proximal dorsal just enough to expose the metatarsocuneiform joint, keeping medial to the extensor hallucis longus tendon. Anatomic dissection is continued to the deep fascial level. The extensor hallucis longus is identified and retracted laterally. The joint level of the first metatarsal cuneiform is identified and the periosteal is incised in a linear fashion and retracted.

The use of an AP view paper template for pre-operative planning remains instrumental (Figure 6). A 0.045 inch K-wire, starting approximately 0.5 cm distal to the dorsomedial first met-cuneiform joint acts as a hinge axis guide. This must be tilted along the frontal plane from dorsolateral to plantarmedial, while retaining its perpendicular relationship to the weight-bearing surface. This will allow a small amount of plantar declination along with significant transverse plane abduction of the distal fragment along the medial cortical hinge.

To create the needed wedge osteotomy with good parallelism along the face of the distal and proximal cuts, a Reese Osteoguide System is employed (Figure 7). The guide slides into the pre-drilled axis guide, and the distal cut is created first at 45° to the long axis of the first metatarsal. This is a through and through osteotomy while maintaining the axis guide and hence, the medial cortical hinge. Next, the Osteoguide is rotated along the K-wire in a diatal direction to enable the second through and through cut. The angle of the wedge should replicate the amount of bone resection needed to replicate the

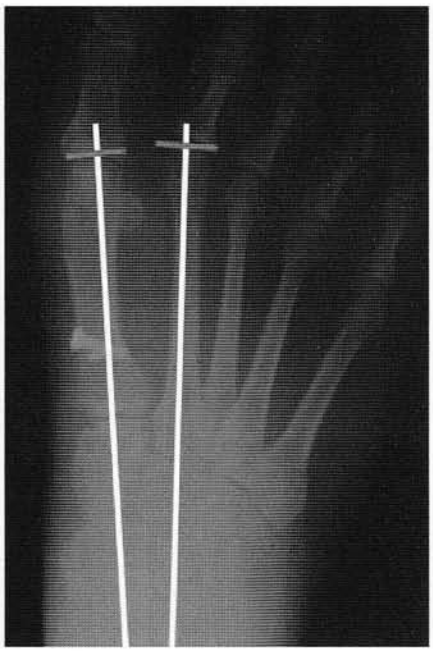

Figure 5. Metatarsal Protrusion Distance (MPD).

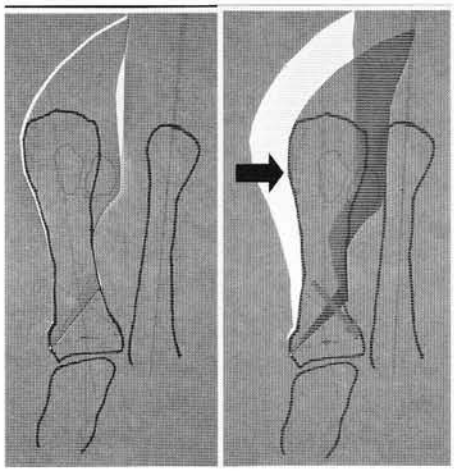

Figure 6. Preoperative AP template.

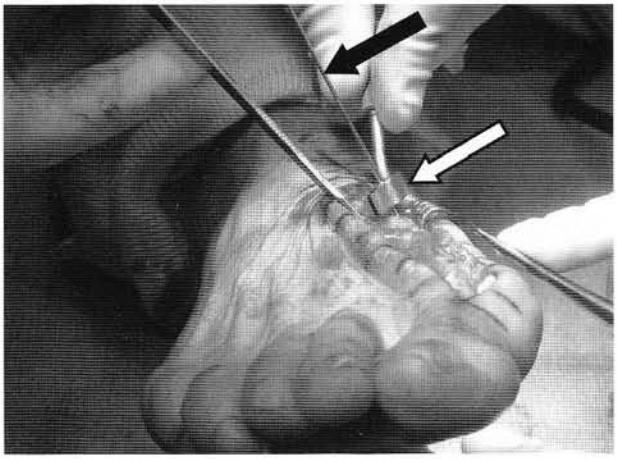

Figure 7. Solid arrow, axis guide. Open arrow, Reese Osteoguide.

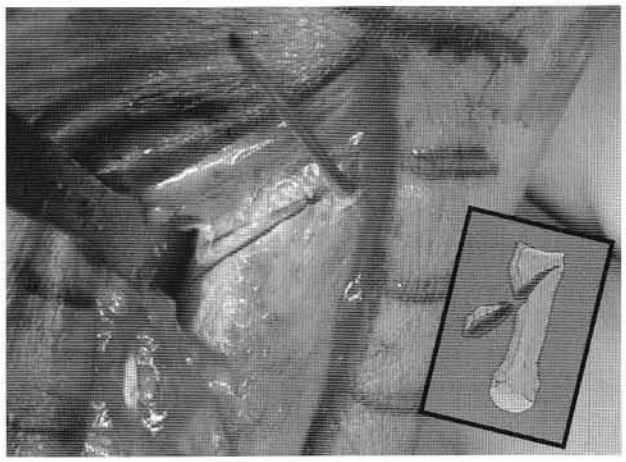

Figure 8. Wedge resection and axis guide.

preoperative template abduction (Figure 8). Generally, 3 to 5 mm of bone along the lateral cortical base of the wedge will be removed, while keeping in mind that 2 mm of this will be attributed to the osteotomies themselves. Once the osteotomies meet at the apex along the medial hinge, the Osteoguide and the K-wire axis guide can be removed. The intervening wedge of bone should slide out from between the osteotomies, and will generally have "C" shaped cross-section if done so in toto.

While maintaining the medial cortical hinge, the opposing face of the osteotomies can be drawn closed gently by hand, with subsequent reciprocal planing to feather them if necessary. The key lies in maintaining the hinge while closing the osteotomies flush for optimal bony apposition and ingrowth during the healing phase. Provisional fixation can then be applied with small pointed reduction clamps. One should appreciate at this point the obvious dorsal cortical step-off along the osteotomy as proof of plantarflexion of the distal fragment. Though various combinations of final fixation can be adequate, this study group involved a perpendicular 3.5 mm cortical interfragmentary screw with AO technique while the bone was clamped, which was then followed by a more oblique proximal 0.065 threaded K-wire upon removal of the clamp. This K-wire was then cut flush to the medial cortex. It serves as an antiglide or anchor screw while the cortical

screw serves as a compression devise. The technique is monitored intraoperatively using fluoroscopy to confirm proper hardware placement. Anatomic closure is then commenced, and the extremity immobilized into a modified equalizer boot or CAM walker with a first ray cut-out modification to continue non-weightbearing on crutches (Figure 9).

RESULTS.

One of the chief concerns noted by patients during the survey was preoperative bunion pain. On a visual analog scale (VAS) of 0 to 10 (10 being worst), the patients reported an average of 7 preoperatively. Postoperative pain was reduced to less than 1 for the 30 feet among the followup group, and an average of 1 for the subgroup of 10 survey patients who were unable to return for followup examination. Among all surveyed, in 41/43 feet (95%), postoperative pain was reduced. Although only 26/43 feet (60%) were reported to have improved first MPJ range of motion, most did not recall ROM being a significant limitation preoperatively. In 36/43 feet (84%), the patients were satisfied with the postoperative appearance (Figure 10). Four feet (9%) had subjective recurrence of the bunion. In thirty-seven feet (86%), patients felt that the chief concerns were addressed. While these same 86% related an overall satisfaction (pleased or very pleased), 2 more feet were rated somewhat pleased (5%). A small subsection of 4 feet (9%) ranked this procedure with displeasure.

Objective postoperative results included first MPJ passive range of motion testing, which averaged 74° of dorsiflexion and 8° of plantarflexion. First ray range of motion was 9mm dorsally, and 8mm plantarly. The postoperative dorsiflexory Stress Lateral view of the first MPJ ROM averaged 70°. The preoperative IMA was 15.8°, and the postoperative was 6.7°. Hallux abductus angles (HAA) were 34.6° preoperative, and 10.6° postoperative. The postoperative Seiberg Index change was 0.5mm, while the KIM index change was 0.7mm. The metatarsal protrusion distance shortened by 3.0 mm. Subjects in this study had no non-unions or postoperative infections.

DISCUSSION

Good clinical judgment has the greatest preoperative influence on final patient outcome when surgically correcting hallux valgus deformity. One of the things surgeons can control most is good intra-operative technique. This study shows that highly reproducible and excellent outcomes are possible with the oblique CBWO when consistent hinge-axis and AO principles are followed. Further, the technical demands can be mastered with a good step-wise approach and attention to detail.

Intermetatarsal Angle Reduction.

This CBWO procedure remains a very useful adjunct in the comprehensive approach to surgically correct HAV deformities with severe IM angle deviations, or IM angles

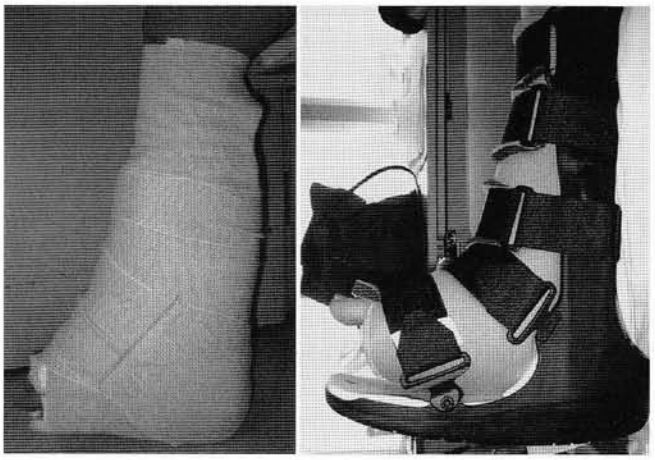

Figure 9. Non-weightbearing immobilization.

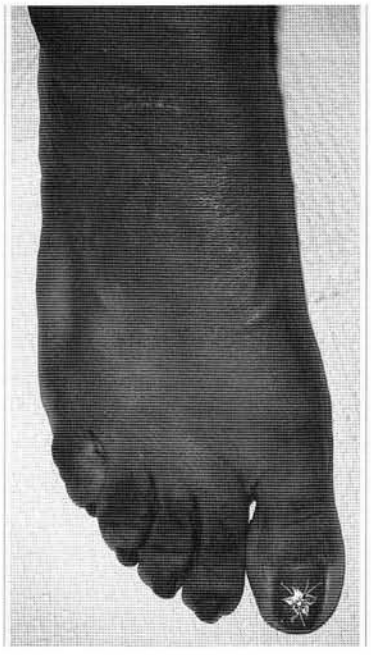

Figure 10. Postoperative clinical followup.

with increased metatarsus adductus angles (MAA). It offers a true reduction of the IM angle without sacrificing significant bone loss. The average IMA reduction in this study was 9°. Most maintained good reduction over the years, although a select few showed recurrence fairly quickly.

Recently, Lutonsky and Sponer reported that they corrected the IM angle by 10 degrees within a group of 12 adolescent feet.[8] Seiberg et al found an average IM angle reduction of 12.1 degrees at least six months postoperatively.[9] Pontious et al reported that the average IM angle correction on followup decreased from a preoperative measurement of 13.21 degrees to a postoperative measurement of 4.29 degrees.[10] Ruch's subgroup of 150 patients who remained nonweightbearing for at least four weeks had an average IM angle reduction of 12 degrees.[11] Schuberth et al noted greater than 8 degrees of relative reduction, while Nigro et al obtained greater than 6 degrees of correction.[6,12]

Static laboratory model studies have also validated the efficacy of the transverse plane correction using the oblique CBWO. Nyska et al recently obtained 5 degrees (SD = 3.8 degrees) of reduction (their oblique CBWO construct was not pre-reduced with bone clamps). Models used by Fillinger et al were reduced by 12 degrees.[13,14]

Metatarsal Length Effects.

The traditional metatarsal protrusion distance (MPD) by a circumscribed distal arc tangential to the second metatarsal head has been a mainstay to measure the relative metatarsal lengths before and after surgery. If the IM reduction is so great as to yield a small or negative IMA, a dilemma is created as no intersecting apex is available on the plain film radiograph. The very small IMA reference lines never intersect on the viewing field from which to construct the distal arc.

Research has not supported the notion of excessive shortening when the CBWO is well controlled. In fact, the postoperative metatarsal protrusion distance is on par with "safer" distal osteotomies. It is even less when one compares it to the postoperative metatarsal protrusion surgeons may see with the Lapidus arthrodesis of the first metatarsal-cuneiform joint. This procedure requires one to resect and/or curette biarticular cartilage and portions of subchondral bone causing more shorthening of the first ray.

With a 10 degree wedge resection angle, Banks et al found that shortening was minimized to 1.7 mm, while Nyska et al noted a 2.0 mm shortening among their static models.[13,15] Higgins et al found shortening averaged 1.3 to 2.3 mm depending on fixation technique.[16] Seiberg et al observed that the metatarsal protrusion distance was shortened by 2.9 mm after a minimum of six months postoperative, although it was only 2.6 mm immediately postoperative.[9] This current study observed an average of 3.0 mm of shortening.

On the other hand, there can be more aggressive shortening as a result of other proximal procedures. The Lapidus arthrodesis, for instance, yields more first ray shortening compared to most CBWO published reports. When one employs an additional wedge resection in preparation for the arthrodesis, an average of 5 mm shortening can occur.[17] Other studies have concurred with findings ranging from 4.7 to 7.5 mm.[18-20] Even with subchondral bone preservation, shortening can still be pronounced.[19]

Metatarsal Sagittal Plane Effects.

Several authors report acceptable results with minimal metatarsus primus elevatus.[8,12] However, they fail to comment on their sagittal plane evaluative technique concerning various osteotomized hallux valgus procedures. This study introduces the concept of the Kinetic Inclination Metatarsal (KIM) Index. It is a simple measure to note and track sagittal plane changes of the distal weight bearing surface of the first metatarsal. Results from this study confirm prior findings showing the CBWO can effectively restructure the first ray in treating hallux valgus without significant dorsal migration of the capital segment. The rate of new transfer lesions found among subjects bear this out. Some patients had diffuse submetatarsal hyperkeratoses, but many if not most were pre-existing. Furthermore, no patient related submetatarsal pain following the procedure.

The KIM Index is also versatile. The same weightbearing component of the plantar first metatarsal can be followed over subsequent postoperative radiographs even if a primary arthrodesis (Lapidus), or ancillary procedures (such as the plantarflexory Cotton wedge osteotomy) are performed in conjunction with the CBWO. The index only represents a quantifiable change in the anatomic relationship between the distal segment and any stable radiographic landmark along the first ray as long as it is proximal to the surgical site under investigation. With the Lapidus, for instance, the plantar proximal articular apex of the medial cuneiform could be used on serial lateral view radiographs. Elevatus can be detected relative to the preoperative image in reference to a stable weightbearing substrate.

This new index correlated well with the Seiberg Index using data from long-term followup radiographs when patients from this study appeared to have reached

their sagittal plane end-point. It is paramount that the referenced weightbearing plane be systematically determined.

The KIM Index also seems less sensitive to first metatarsal position changes as the Seiberg Index. Though somewhat altered, it usually is affected to a lesser degree. However, it does appear to be a more specific marker for detecting structural elevatus because it relies on two stable anatomic reference points, namely the weightbearing surface of the metatarsal head, and a proximal landmark unchanged by the procedure in question. If the first metatarsal is truly elevated by ground reactive forces secondary to surgical technique or excessive bone resorption, this dorsal malunion can be readily evident.

The KIM Index is a true structural parameter affected mostly by changes across the surgical site(s) in question. Therefore, it has the added benefit of evaluating capital fragment osteotomies as well, such as the Green-Watermann or Austin (chevron) procedures.

While postoperative dorsal translocation (malunion) of the distal segment is an inherent risk to the CBWO, it is not any more so when compared with other proximally based osteotomies. Indeed, the proper use of the hinge axis concept can preserve or even reverse the first metatarsal head sagittal plane position. In 1984, Schuberth et al found that nearly 94 percent of first metatarsals were elevated among 159 procedures studied.[6] In fact, the average elevation was nearly 6.7 degrees. However, in that study, the treatment varied with regards to laterality, fixation technique, immediate weight-bearing, and patient age. (Not surprisingly, shortening was also the greatest in that study.)

However, one sees minimized postoperative elevatus in studies that have taken these factors into account. Higgins et al reported 0.8 degrees of elevatus using double K-wire fixation while Seiberg et al found 1.1 degrees using either cortical or cancellous screw fixation.[9,16] In both studies, researchers emphasized strict non-weightbearing for at least 6 weeks and early range of motion consistent with AO principles.

POSTOPERATIVE COURSE

The proximal nature of the osteotomy imposes a higher dorsiflexory moment arm that one must neutralize, and unlike some osteotomies such as the Austin or Scarff, it is inherently unstable early on. In adherence to basic tenets of AO fixation techniques, it is generally agreed that early direct weightbearing in the postoperative phase is contraindicated.

Despite the inconvenience of non-weightbearing, subjective patient satisfaction rates have remained high. Studies showing excessive shortening, elevatus, robust callus formation, or failed unions have been correlated to premature weightbearing only. A knee walker with 5-inch wheels has been the device of choice for some patients who find ambulating with crutches difficult.[27] The Roll-A-Bout is also an excellent alternative to help maintain non-weightbearing.[28]

Postoperative care for the lapidus can be slightly longer. Some have cited the upper end of the non-weightbearing period for the lapidus as being between eight and 10 weeks.[18,29-31] If one employs a bone graft, the non-weightbearing period may even require 12 weeks.[32]

Bone Healing Rates

Consistent with historical data, patients who underwent the CBWO healed uneventfully, although 3 feet underwent medial cortical hinge fractures. No patient experienced unresolved pain in this group.

Although there is a paucity of recent data for bone union rates using the oblique CBWO, delayed and nonunions are far less prevalent than historically perceived. In 1982, Ruch found that among 50 cases that involved six weeks of postoperative management with a non-weightbearing short leg cast, only one case (2 percent) ultimately developed failure of fixation. Another individual (2 percent) showed external callus formation.[11] In Polansky's small study in 1985 using Herbert screw fixation, no bone healing failure was observed.[21] In 1994, Seiberg et al reported no incidents of delayed or nonunions among 31 oblique CBWO procedures.[9] Pontious et al reviewed adolescent HAV cases, 35 of which included the CBWO. They found no complications of osteotomy healing.[10] In 1996, Higgins et al reviewed 33 consecutive CBWO procedures and also reported stable bone healing and no failures.[16]

However, union rates for the lapidus can be more problematic. Although lesser nonunion rates have been reported (3.3 percent by Grace et al and 5.3 percent by Patel et al), bone healing complications can be high.[22,23] Metzdorf and Strehle observed a nonunion rate of 8.8 percent; Sangeorzan and Hansen reported 10 percent; Catanzariti, et al noted 10.6 percent; and Coetzee et al cited 11.5 percent.[17,18,24,25] Furthermore, Saffo, McInnes and Myerson all found 12 percent nonunion rates.[19,20,26]

Faber's study also found that delayed unions and nonunions were 7.8% and 9.8% among the Lapidus group, respectively. Although metatarsal shortening was less among the lapidus group, the exact method for radiographically measuring met protrusion was not specified. Coetzee et al found nonunions were problem-

atic among 6.7% of 105 feet studied, while Patel et al found the rate slightly lower at 5.3% across 227 feet.

Motion Preservation

Retaining functional range of motion across all articular segments distal and proximal to the osteotomy is a key benefit of the CBWO. This is less touted in literature, but nonetheless quite significant by allowing for continued natural ROM throughout the rest of the joints in the foot. A significant observation from this study showed that long-term followup patients showed no new radiographic or clinical signs of osteoarthritis in previously unaffected joints, particularly those more proximal as in the dorsal navicular-medial cuneiform or talar-navicular segment. It seems that long-term reporting of low arthritic morbidity to nearby joints in the foot following an arthrodesing procedure such as the Lapidus would be necessary to validate its effectiveness.

Among patients available for followup after a minimum of 6 months, the average first MPJ dorsiflexory ROM postoperatively was 74°. The average plantarflexory ROM was 8°. Several patients did report some postoperative dorsiflexory sense of stiffness, although these same patients were functional in soft soled shoegear.

The field of biotensegrity is a system based on the naturally-occurring, self-generating truss. It is an optimized, low-energy omnidirectional hierarchical construct. There is a cabling effect, an example of which is demonstrated by the cable cranes one would see in high-rise building construction projects. Changing one part affects the rest. Forces tend to return to their original state. With biotensegrity, the foot becomes part of an integrated truss system. As in all truss constructs, there are only tension and compression elements. There are no levers or bending moments nor is there any torque at the joints.[33] This makes for a mechanically efficient system that stores and returns energy with smooth motion in an efficient gait pattern. Muscles develop tension on the fascia, providing protection, energy return and smooth motion.

Arthrodesis leads to "disintegration of gait" with increased energy consumption, decreased gait speed and increased pressure on other joints. One would see a good example of this with ankle arthrodesis.[34] Although fusion of the first metatarsal cuneiform joint will not have as dramatic effect as fusion of the ankle joint, is there any doubt that there will be some gait disintegration and new stresses placed on other joints? Arthrodesing procedures create circumstances that are consistent with the aging process. Decreasing tension with loss of flexibility and mobility increases stiffness. There is decreased energy efficiency and increased demands on other joints.[35] Recently, Lakin et al reported the quantitative significance of contact mechanics across the Lisfranc complex.[36] They eloquently demonstrated how each metatarsal cuneiform joint is significantly involved in regulating pressures and redirecting forces in response to leg bone axial compressive loads.

Proponents of the Lapidus maintain its necessity to increase medial column stability secondary to hypermobility of the first ray for hallux valgus correction. Faber et al recently showed in their prospective, blinded, randomized study that there was no significant relationship between the Lapidus and a distal head procedure, or between subgroups of feet with hypermobility at the first tarsometatarsal joint and those with non-hypermobile first rays. The latter finding is particularly important.

Dananberg has lectured extensively on the relationship of back-connected pathology related to decreased motion of the first metatarsophalangeal motion, and decreased motion of the first ray.[37] First ray plantarflexion is necessary for normal gliding motion of the first metatarsophalangeal joint. Mobility of the first ray allows increase range of motion of the first metatarsophalangeal joint.[38] Therefore, one should exercise caution when contemplating use of proximal arthrodesing procedures.

CONCLUSIONS.

The oblique closing base wedge osteotomy has been demonstrated to be a successful mainstay for proximal correction of severe hallux valgus and metatarsus primus varus deformity. Though limitation towards selective shoegear is a concern by some women from this study, patient satisfaction regarding preoperative pain and cosmesis remains high. The outcomes support prior observations for effectively correcting large IM angles while maintaining less shortening of the first metatarsal, improved bone healing, and less postoperative disability compared to the Lapidus arthrodesis. Both are moderately difficult to perform, although the Lapidus is probably the procedure of choice when there is metatarsocuneiform joint arthritis, painful motion, or dislocation. The most significant difference between the two, however, is preservation of translational and longitudinal motion as the CBWO allows for a more biomechanically sound postoperative course under most circumstances.

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