CHAPTER **33**

OPENING BASE WEDGE OSTEOTOMY FOR CORRECTION OF HALLUX VALGUS

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INTRODUCTION

The opening abductory base wedge osteotomy (Trethowan) of the first metatarsal is a procedure indicated for the correction of hallux valgus with a large intermetatarsal angle and a shortened first ray (Figure 1). In the past, the procedure has fallen out of favor due to a number of technical reasons. The most common reason for avoidance of the opening wedge procedure is the difficulty to obtain adequate fixation of the osteotomy. Other reasons include the need to obtain a bone graft, prolonged period of nonweightbearing, elevatus of the first ray, first metatarsophalangeal joint narrowing, and fear of delayed or non-union.

In hallux valgus with larger intermetatarsal angles, closing base wedge osteotomies and Lapidus arthrodeses are utilized more often than opening wedge osteotomies due to familiarity of those procedures. Moreover, rarely is bone grafting necessary. These methods are successful in the outcome of hallux valgus correction; however, each of these techniques may lead to shortening of the first ray (Figures 2, 3). A shortened first ray may lead to lesser metatarsal overload attributing to (metatarsalgia) second metatarsophalangeal joint pain, instability, and/or callous development. It is difficult to avoid metatarsal elevatus in a closing base wedge osteotomy; despite 8 weeks of cast immobilization (Figure 4). This is probably due to the typical fixation construct of 2 lag screws across the osteotomy that does not shield plastic deformation of bone.

Figure 1. X-ray illustrating a large hallux valgus deformity with a short first ray caused by a previously failed bunionectomy.

Figure 3. Postoperative x-ray of a closing base wedge osteotomy. Note slight shortening of the first metatarsal by examining the location of the sesamoids compared to location of the sesamoids preoperatively in Figure 2.

Figure 2. Preoperative x-ray of failed bunionectomy.

New forms of fixation designed specifically for the opening base wedge osteotomy have been developed. The tibial opening wedge plate system for tibial varum was modified for the first metatarsal. These fixation devices are plate systems with or without locking screws. Better fixation constructs allow weight bearing to commence earlier and diminish the risk of the complication of first metatarsal elevatus. Also, there is a plethora of bone graft substitutes that are ideal for this opening wedge application. Therefore, the opening base wedge osteotomy can be performed when indicated without many of the previously mentioned concerns.

Trials and Tribulations of Bunion Surgery

As foot surgeons, we are all trying to master the art of bunion surgery every time we enter the operating room. Most of the time we are pleased with the outcome, however, failures do occur especially in the long-term (Figures 5-7). Most of us will agree that under correction of the deformity is an all too common concern. The mobility of the first ray is often the reason for inadequate correction. If the first ray is too flexible, then we lose our correction of the osteotomy over time. If the first ray is too rigid, then it can be difficult to obtain correction on the table. We teach our surgical residents a general rule (remember all rules have exceptions): if the first ray is very flexible or rigid, then do a base osteotomy or Lapidus arthrodesis; everything else can get an Austin (or equivalent). Just remember, clinically, all bunion deformities are different and therefore we cannot treat this deformity simply by drawing angles on radiographs and come up with a treatment plan.

Figure 4. Lateral x-ray illustrating elevatus of the first metatarsal despite 8 weeks of cast immobilization.

Figure 5. Preoperative x-ray illustrating a moderate bunion deformity.

Figure 6. Immediate postoperative x-ray revealing adequate reduction of the deformity.

Figure 7. Six months postoperative x-ray showing recurrence of deformity.

OPENING BASE WEDGE OSTEOTOMY TECHNIQUE

The patient is placed on the operating table in a supine position. Anesthesia may be obtained with intravenous sedation and local anesthesia, or a general anesthetic. Hemostasis is achieved with a tourniquet or with local administration of epinephrine according to the surgeon's preference. A proximal first ray block is performed with local anesthesia. Location of the first metatarsal cuneiform joint is identified with fluoroscopy and marked with an ink pen.

The first part of the procedure involves the "bunionectomy" removing the exostosis and performing the standard lateral release of the first metatarsophalangeal joint. Next, the incision is carried more proximal to the level of the first metatarsocuneiform joint. Dissection is carried down through the subcutaneous tissues, retracting the extensor hallucis longus tendon laterally. The authors choose not to reflect the periosteum at the osteotomy site. A 0.062 K-wire is used as an axis guide and is inserted dorsal to plantar at the site of the lateral hinge. The axis guide should be perpendicular to the weightbearing surface to avoid elevatus of the metatarsal. Fluoroscopy is utilized to identify the location of the hinge, which should be about one centimeter to 1.5 cm from the joint (Figure 8). A quick tip to accurately access your location on fluoroscopy is to aim the beam of the x-ray down the K-wire (Figure 9). Once the location of the hinge is adequate, making sure the extensor tendon is retracted dorsally and laterally, a sagittal saw is used to make a transverse osteotomy to the axis guide. Two small osteotomes are then inserted medially in the osteotomy and a gentle prying motion will open the osteotomy without disrupting the lateral cortex. The appropriate-sized plate is then placed over the osteotomy with the incorporated wedge portion holding the osteotomy open. The accompanied screws are inserted by pre-drilling, measuring, and then inserting self tapping screws (Figure 10).

Intraoperative images are taken to assess correction with translocation of the metatarsal head over the sesamoids. Fluoroscopy is also used to confirm screw purchase of the far cortices and not violating the metatarsocuneiform joint. Bone graft material may be placed in remaining gap lateral to the plate wedge. Generally the "bunion" exostosis can be crushed and used as graft. Usually, more graft is needed, which can be augmented with whatever allograft one has on hand. Finally, range of motion and position of the hallux is evaluated. Any other adjunctive procedure (soft tissue or osseous) can then be performed as deemed necessary. Layer closure and a compression dressing with posterior splint are applied.

Figure 8. Lateral view under fluoroscopy illustrating the location of the axis guide.

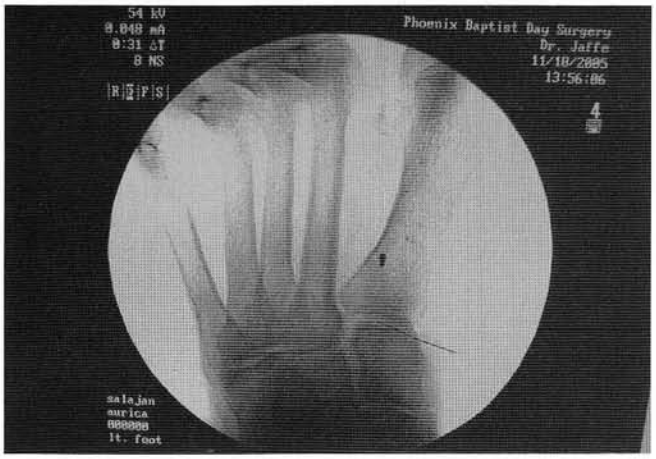

Figure 9. Fluoroscopic image aiming the x-ray beam directly down the k-wire. This allows an accurate assessment of location.

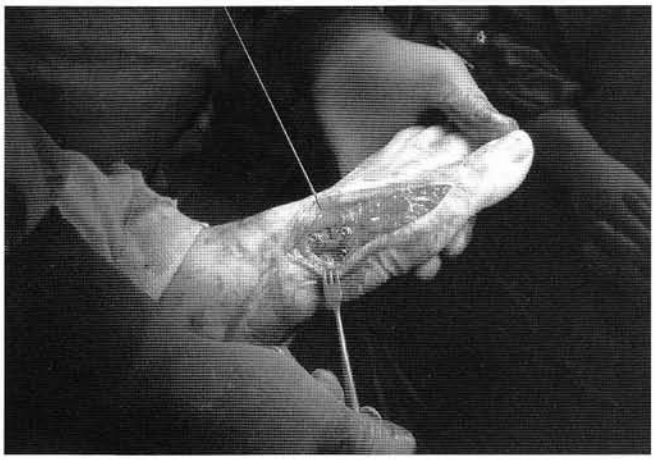

Figure 10. Intraoperative view of the fixation plate over the osteotomy.

Figure 11. Preoperative x-ray of hallux valgus with metatarsus adductus.

Figure 12. Postoperative x-ray following an opening base wedge osteotomy.

Figure 13. Preoperative x-ray of a large bunion deformity with a cross-over 2nd hammertoe.

Figure 14. Postoperative x-ray following an opening base wedge osteotomy and hammertoe repair.

POSTOPERATIVE CARE

The main question is when to start weightbearing. Certainly, there is nothing wrong with being cautious and keeping patients immobilized for 6 weeks. However, it has been our experience that light touch ambulation with a fracture boot in 3 weeks does not seem to cause elevatus or delayed healing. Progressive weightbearing to tolerance is performed over the next few weeks. Usually by 5 to 6 weeks patients are full weightbearing in the fracture boot. Transfer to shoes is typically in 6 to 10 weeks. Radiographs can take months to show complete consolidation of the graft site. Rarely is there any associated pain wearing regular shoes in 10-12 weeks despite lack of complete radiographic healing.

CASE PRESENTATIONS

T. R. is a 36-year-old male with a long-standing bunion deformity. His preoperative x-rays show a large inte metatarsal angle, mild metatarsus adductus, and a relatively short first ray (Figure 11). He underwent a modified McBride bunionectomy with an opening base wedge osteotomy using the Arthrex small fragment plate and screw system. A five millimeter wedge plate was used (Figure 12).

Figure 15. Preoperative x-ray.

Figure 16. Postoperative x-ray illustrating a Reverdin and opening base wedge osteotomies.

Figure 17. Preoperative x-ray. Note that a prior simple bunionectomy (exostectomy) was performed.

Figure 18. Immediate postoperative x-ray. Note that the first and second metatarsals are nearly parallel.

M. F. is a 70-year-old female with a hallux valgus deformity with an extremely large intermetatarsal angle. She had a cross-over second hammertoe as well (Figure 13). She underwent a modified McBride bunionectomy with an opening wedge osteotomy using the Darco BOW plate system. A four millimeter wedge plate was used. She had an ancillary procedure on the second digit to repair the cross-over deformity (Figure 14).

H. Z. is a 28-year-old female with a past medical history of cerebral palsy. In addition to a large bunion deformity, she had significant gastrocsoleus equinus (Figure 15). She underwent a gastrocnemius recession, modified McBride bunionectomy with a Reverdin osteotomy and opening base wedge osteotomy. An Arthrex small fragment plate and screw system was used. A five millimeter wedge was used (Figure 16).

CONCLUSION

The opening base wedge osteotomy is again becoming a viable option in the correction of moderate to severe bunion deformities in cases where there is preoperative shortening of the first metatarsal. With the use of newly designed opening wedge plates and screw fixation