CHAPTER **22**

REPOSITIONAL BUNIONECTOMY: Using Absorable Screw Fixation

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INTRODUCTION

Bunionectomy remains among the most common procedures performed by the podiatric surgeon. Despite multiple procedures and technological improvements, difficulties still arise from poor bone quality, fixation failure, delayed union, nonunion, and recurrence. A significant number of the complications from bunion surgery arise directly from problems with osteotomy or arthrodesis failure. In an effort to avoid these complications, several new techniques have been developed in an effort to avoid osteotomy or arthrodesis altogether. These techniques have involved placement of screws or suture between the first metatarsal and adjacent metatarsals. Originally described by David Friscia, MD and recently modified by Todd Kile, MD a new technique provides some promise in minimizing hallux valgus surgery complications. The authors have utilized a new technique utilizing absorbable screw fixation since September 2004, with good results. We will outline the surgical technique involved to correct hallux valgus with soft tissue correction and manual repositioning of the first metatarsal and stabilization with absorbable screw fixation.

DEVICE

The Arthrex Trim-It (Arthrex, Naples, FL) 4.5 cannulated screw is a relatively new device. The screw is made completely of Poly-L Lactic Acid (PLLA). There have been over one million absorbable implants placed since 1994 with low rates of complication. The resorption time is approximately 12 to 60 months depending upon size of implant and vascularity of bone. There have been reports of foreign body reaction and granuloma formation, but these are primarily with faster resorting materials Polyglycolic Acid (PGA). The Arthrex Trim-It 4.5 cannulated screw comes in a 60-mm size and is trimmed as necessary for various applications.

PATIENT CRITERIA

Although the technique can be performed on most bunions, greatest success is achieved in the flexible deformity were no visible rigid osseous defect is present. This can be tested clinically and radiographically by manual manipulation, placing lateral pressure on the medial aspect of the first metatarsal head. If significant reduction occurs to a point where the first metatarsal abuts the second metatarsal head, it can be assumed that the deformity is reducible. However, radiographic confirmation can also be obtained utilizing self adherent stretch wrap such as Coban. Simply reduce the first metatarsal head in reduced position and wrap the forefoot with Coban temporarily. Obtain new radiographs of the foot with the Coban in place and assess the reduction of the intermetarsal angle. If significant reduction occurs, this will offer some verification that the repositional procedure should provide an excellent result without the use of bone osteotomy. The surgical technique is described below.

TECHNIQUE

As with all hallux valgus procedures, the importance of appropriate soft tissue handling and rebalancing remains critical. The procedure can be performed from either a dorsal or medial incision based on surgeon's preference. Typically, the authors will perform a small dorsal incision overlying the first metatarsophalangeal joint to achieve adequate joint rebalancing and contracture release. The hallux valgus deformity is addressed in a stepwise fashion in the following sequence: anatomic dissection, exostectomy, temporary fixation, guide pin placement, absorbable screw placement, and closure.

Incision and Soft Tissue Release

Because a significant portion of this procedure is performed under fluoroscopic guidance, the patient needs to be positioned distally on the operating room table with

their heels flush with the end of the bed. This will allow excellent visualization of the forefoot and midfoot structures under image intensification. The patient is prepped in the usual fashion, but care should be taken to administer local anesthesia proximally and dorsally across the level of the second and third metatarsal cuneiform articulations. A 3 to 4-cm dorsal linear incision is then performed just medial to the EHL tendon. Sharp and blunt dissection follows through the superficial fascia and subcutaneous tissue to the level of the first metatarsophalangeal joint capsule. Attention is then directed to the first interspace where typical standard dissection for release of the adductor tendon and fibular sesamoidal ligament is performed. Adequate soft tissue release of the sesamoid complex is particularly important for complete reduction of the hallux valgus deformity without osteotomy.

Attention is then redirected back to the medial capsule where the surgeon's individual capsulotomy of choice is performed with resection of the hypertrophied medial eminence. Despite the fact that an osteotomy has been avoided, there still exists a possibility of hallux varus, particularly with a flexible deformity. Care should be taken to avoid excessive resection of the metatarsal head.

Temporary Fixation

At this time, under fluoroscopy, the first metatarsal head is then manually reduced into a relatively parallel alignment with the second metatarsal. A smooth 0.045-inch Kirschner-wire is then driven from medial to lateral from the first metatarsal head into the second metatarsal head for temporary fixation. Care should be taken to position the first metatarsal in the sagittal plane as well with slight plantar flexion. Next, under image intensification the intermetatarsal angle and sesamoid position are evaluated with care not to overcorrect the deformity. When satisfied with the temporary alignment and fixation, attention can be directed to final screw fixation.

Absorbable Screw Fixation

The dorsal incision can simply be lengthened proximally as is illustrated, or a small secondary incision can be made. A 1-cm incision is made medially at the base of the first metatarsal for introduction of the guide pin from the Arthrex Trim-It 4.5 cannulated screw set. The soft tissues are retracted and a pin inserted at the proximal first metatarsal base, approximately 1-cm distal to the metatarsal cuneiform joint. The guide pin is directed under image intensification across the second and third metatarsal bases. Care should be taken to avoid any intra-articular placement of the guide pin and subsequent screw. The angulation of the pin is important as the second metatarsal sits slightly higher than the first metatarsal so a plantar distal medial to dorsal lateral proximal direction must be achieved for accurate placement. An intraoperative lateral projection should be obtained to ensure that the guide pin purchases both the second and third metatarsal bases.

Once appropriate placement of the guide pain has been verified, the under drill, countersink, and overdrill are performed. The length is then measured utilizing the cannulated depth gauge. A fair amount of countersink can be performed under flouroscopy for proper seating of the head of the screw in an effort to avoid screw prominence. The 4.5 screw is then sized using the Arthrex hot loop cutter and designated measuring device. Because the cut tip of the screw is resharpened, add approximately 2-mm to the measured length. The tip of the screw is then sharpened and a pin run through the cannula of the screw to remove any debris from the trimmed end of the screw prior to placement. The screw hole is then tapped and the screw inserted. The screw is placed over the guide pin and tightened to two-finger tightness. The guide pin is then removed followed by removal of the temporary fixation to the first and second metatarsal heads.

Final fluoroscopy images are obtained. Carefully examine the lateral aspect of the third metatarsal and make sure no dorsal prominence of the screw is appreciated. If any significant prominence is appreciated, a secondary accessory incision can be made overlying the tip of the screw, and any prominent screw is simply cut flush with the bone laterally. This is preferred as opposed to removal and reinsertion of the screw unless bone quality is determined to be excellent. Capsulorraphy is then performed around the medial aspect of the first metatarsophalangeal joint finalizing the soft tissue rebalancing and stabilization of the joint. Davis's law will allow remodeling of the capsule, which aids in the long-term correction of the deformity. Subcutaneous tissues and skin are then reapproximated, based upon surgeon preference.

Postoperative Care

This is an area of some controversy, but each patient needs to be evaluated carefully. Protected weightbearing in a short-leg fracture boot is recommended with nonweightbearing for the first 3 weeks. Typically after 6 weeks, a transition to supportive shoe gear is allowed with physical therapy ordered as needed.

SUMMARY

The absorbable screw is able to maintain correction long enough for the soft tissue structures of the first metatarsophalangeal joint to remodel and stabilize. As the resorption

period is anywhere from 1 to 5 years, the soft tissues have adequate time to rebalance. Additionally, because of the screw's physical presence within the screw hole, stress risers are minimized and the risk of stress fracture quite low. Several case studies are presented with greater than 1 year follow-up to demonstrate the effectiveness of this technique. It is hoped that this technique will offer another option in treating hallux valgus deformities.

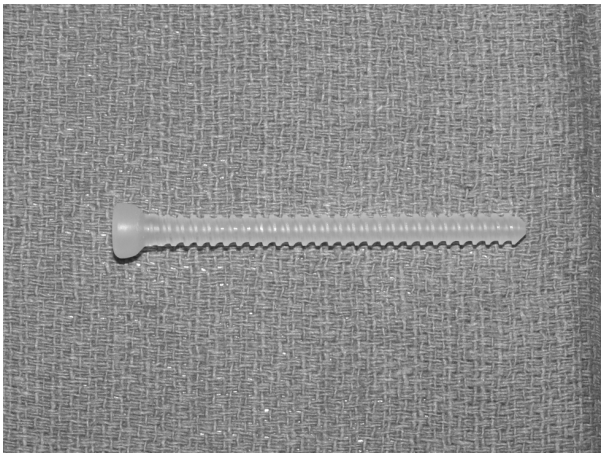


Figure 1. Arthrex Trim-It 4.5 cannulated screw.

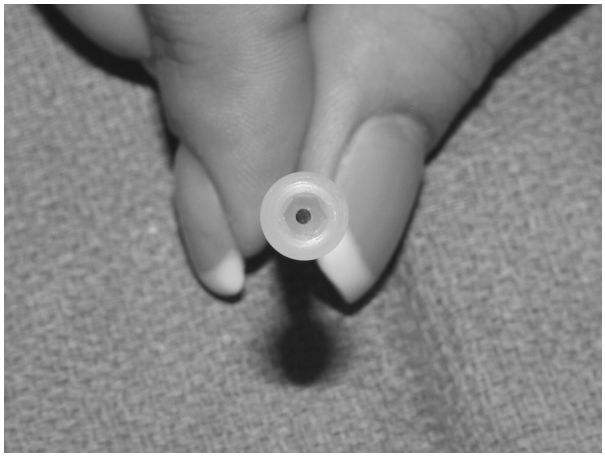


Figure 2. Top view of the Arthrex Trim-It 4.5 cannulated screw.

Figure 3. Typical incision placement.

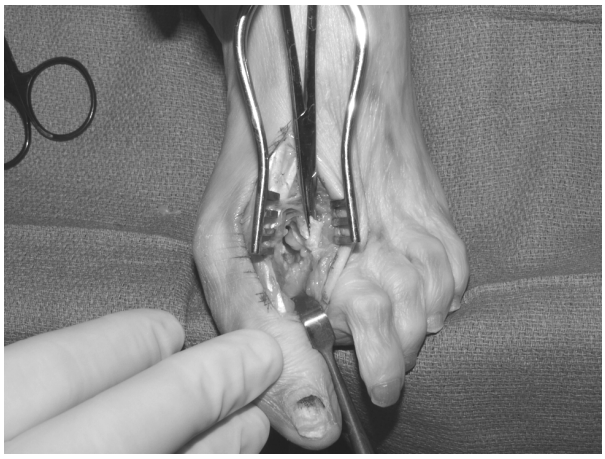


Figure 4. Soft tissue release.

Figure 5. Soft tissue release.

Figure 6. Intraoperative verification of intermetatarsal angle reduction.

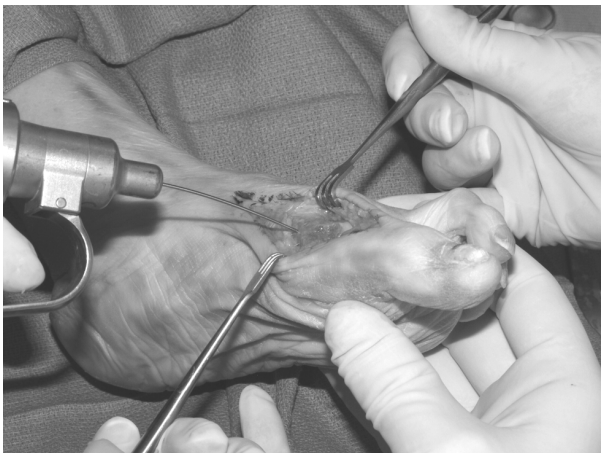


Figure 7. Intraoperative placement of temporary fixation.

Figure 8. Fluoroscopic placement of temporary fixation.

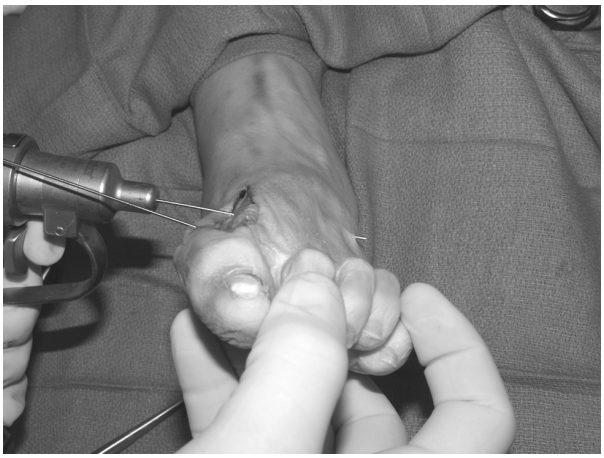


Figure 9. Placement of cannulated screw guide pin.

Figure 10. Fluoroscopic view of placement of cannulated screw guide pin.

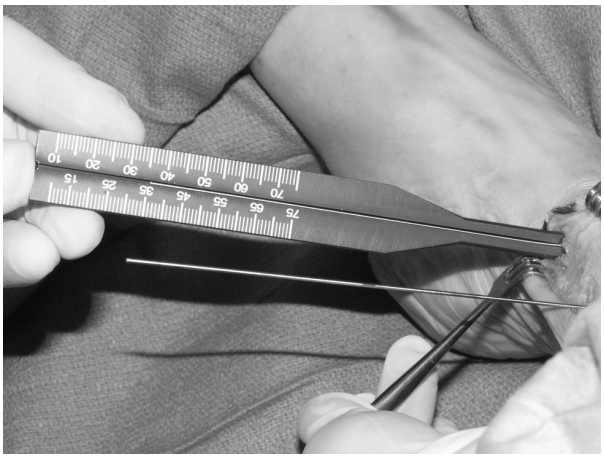


Figure 11. Measurement of screw length using cannulated depth gauge.

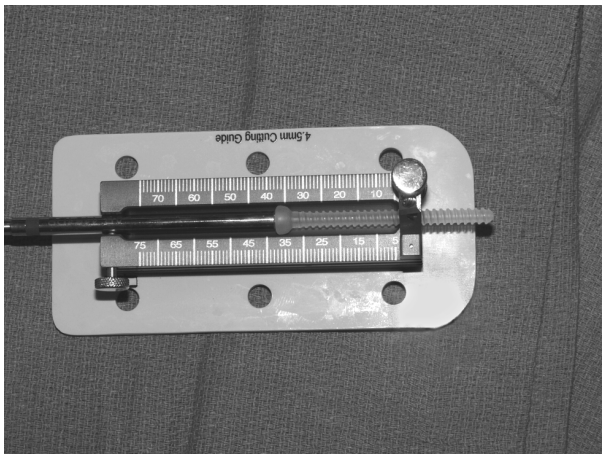


Figure 12. Trimming of the Arthrex Trim-It 4.5 cannulated screw.

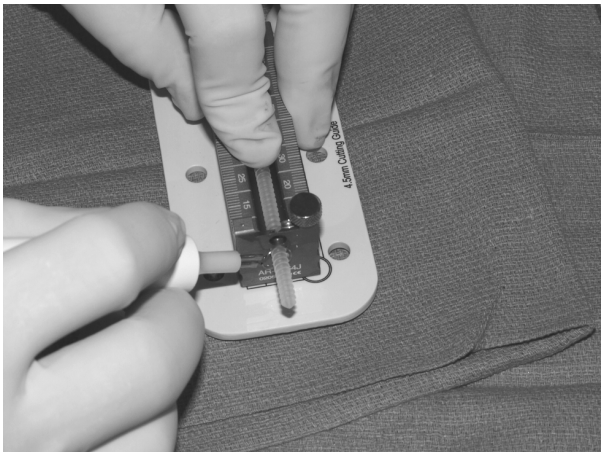


Figure 13. Trimming of the cannulated screw.

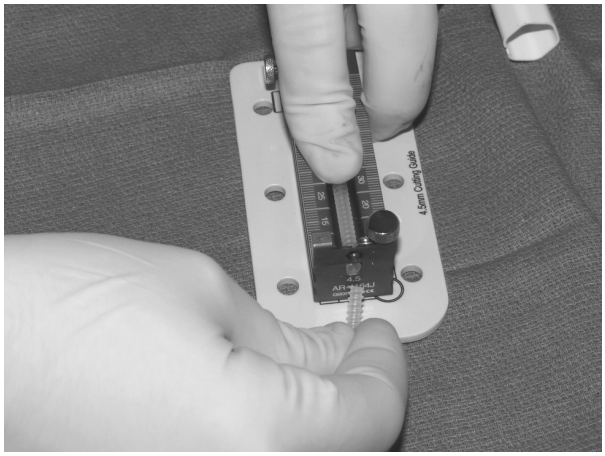


Figure 14. Trimming of the cannulated screw.

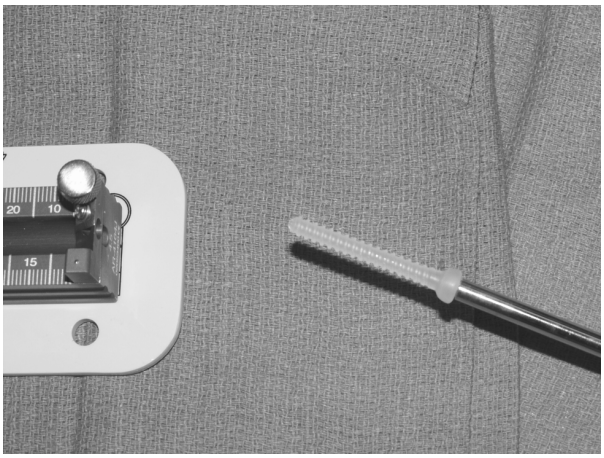
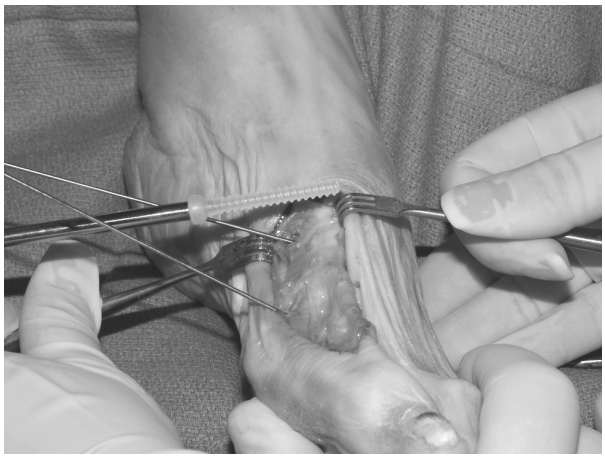


Figure 15. Note the resharpened tip after trimming.



Figures 16. Insertion of the screw.

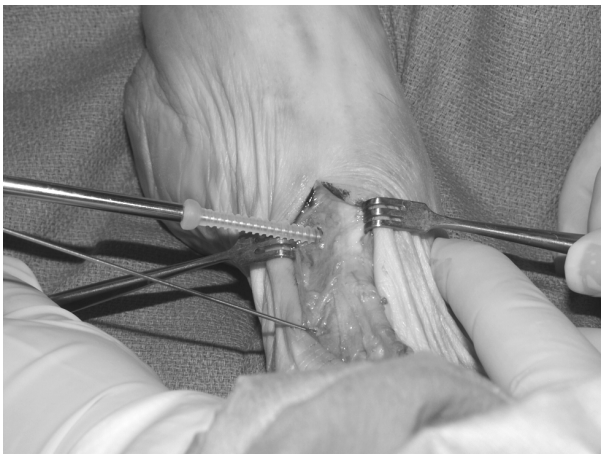


Figure 17. Insertion of the screw.

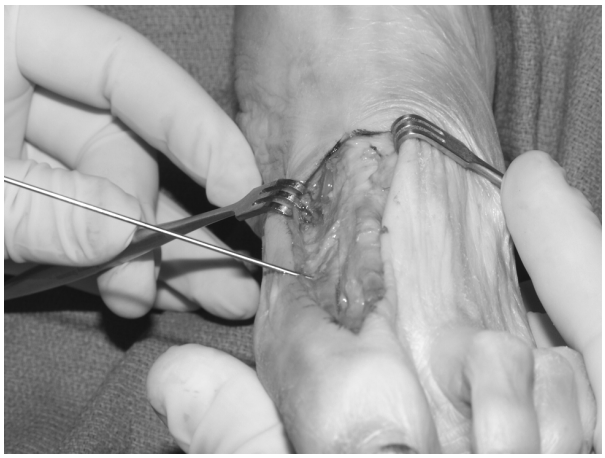


Figure 18. Insertion of the screw.

Figure 19. Final stabilization of the bunionectomy.

Figure 20. In the event of the screw being too long and prominent dorsally, an accessory incision is made and the screw excess trimmed flush with the bone.

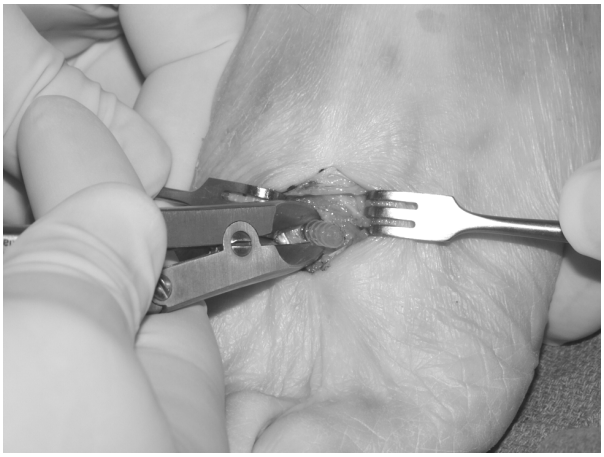


Figure 21. The screw excess is trimmed.

Figure 22. Preoperative radiograph of a 74-year-old woman.

Figure 23. Postoperative radiograph following bunionectomy and hammertoe correction. Note the presence of the absorbable screw tract.